ODONTOGRAPHY;

OR, A

TREATISE

ON THE

COMPARATIVE ANATOMY OF THE TEETH.

Atlas.

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COMPARATIVE ANATOMY OF THE TEETH;

THEIR PHYSIOLOGICAL RELATIONS, MODE OF DEVELOPMENT,

AND

IN THE

VERTEBRATE ANIMALS.

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VOLUME II.

ATLAS

CONTAINING ONE HUNDRED AND

LONDON:
HIPPOLYTE BAILLIERE, PUBLISHER,
FOREIGN BOOKSELLER TO THE ROYAL COLLEGE OF SURGEONS.
219, REGENT STREET.
PARIS: J. B. BAILLIÈRE LIBRAIRE DE L'ACADÉMIE DE MÉDECINE.
LEIPZIG: T. O. WEIGEL.
1840—1845.

LONDON:
Printed by Schulze & Co., 13, Poland Street.

DESCRIPTION OF THE PLATES.

PLATE I.

Diagrams of the development of the dental tissues. *Fig.* 1.—Dentine: *a*, end of a linear series of primary dentinal cells; *a'*, nucleus; *b*, division of the nucleus; *c*, *c*, subdivision and elongation of the nucleolar matter, establishing secondary cells; *d*, elongated nuclei of secondary cells uniting end to end to form the areæ of the dentinal tubes; *e*, *e*, calcified cap of dentine formed by intus-susception of the clear hardening salts into the walls and cavities of the cells, and intercellular blastema, *e'*; and by their partial exclusion from the moniliform nucleolar tracts. *f* *g*, union of two peripheral nucleolar or secondary cells with one nearer the centre of the pulp. *Fig.* 2. —Inner surface of a portion of the calcified dentinal pulp, forming the cap of dentine, which has been displaced: *a*, intervals and walls of primary dentinal cells ('aréoles' of the French Academicians); *b*, indication of walls of secondary cells forming the parietes of dentinal tubes; *c*, nucleolar matter which establishes the areæ of the dentinal tubes, ('granulations des aréoles signalée, par M. R. Owen,' of the French Academicians). For clearer demonstration, the number of tubes in the areæ of the cell is made less than in nature. *Fig.* 3.—Thin calcified portion *a*, resting on *b*, uncalcified portion of the pulp; magnified on half the scale of the preceding scheme. *Fig.* 4. —Enamel: *h*, primary cells suspended in fluid blastema *g*; *i*, the same angularly aggregated to form the actinenchymatous tissue; *j*, the same, becoming cylindrical by either elongation or terminal confluence, *k*, the nucleus disappearing; *l*, the modified prismatic cells, in which the clear hardening salts are impacted, forming the spiculæ and fibres of enamel; magnified on the same scale as figs. 1 & 2. *Fig.* 5. —Cement: *m*, primary cells; *p*, their granular nucleus; *n*, more minutely granular blastema; *n'*, the same, impregnated with the ossific salts; *o*, the primary cell enlarged and receiving the hardening salts; *p'*, the nucleus altered, apparently by pressure of the surrounding salts, and sending out prolongations or rays; magnified on the same scale as fig. 4.

PLATE II.

Magnified view of the vascular plexus of the outer layer of the dental capsule of the incisor of a Calf (*Bos Taurus*). *The same, nat. size. The centre circle shows the divided vessels that penetrate the dentinal pulp. At two parts, *a* *a*, were groups of minute capillaries, in which the blood appeared to be stagnated, and the vessels in progress of obliteration: the cells of the capsule had begun to be calcified at both these parts, and a thin layer of cement to be formed.

In the following Plates the parts are of the natural size, unless otherwise expressed.

PLATE 1.

Various forms of teeth in fishes: the names of the genera are subjoined to each figure. In part *Cuvier* and *Val.*,* in part *original.*

PLATE 2.

Fig. 1.—Head of a Myxinoid fish (*Bdellostoma heterotrema*): *a*, basal pulp, supporting *b*, palatal tooth; *c*, tongue, supporting the lingual dental plates; *d*, tendon of the great retractor muscle of the tongue. *Fig.* 2. Head of *Bdellostoma hexatrema: a*, palatal tooth; *b*, lingual teeth. *Fig.* 3. Section of head of the *Myxine glutinosa*, nat. size; *a*, medulla oblongata; *b*, cartilaginous acoustic capsule; *c*, naso-palatine canal; *d*, dental matrix of lingual teeth; *e*, lingual bone. *Müller.*† *Fig.* 4. Front view of labial and lingual teeth of a Lamprey (*Petromyzon marinus*). *Fig.* 5. Vertical section of the head of the same species shewing the labial teeth: *a*, the palatal cartilage supporting the large bicuspid tooth; *b*, the opposing cartilage below, representing the under jaw; *c*, the lingual cartilage. *Fig.* 6. A section of the persistent pulp, and successive horny dental cones of the Lamprey. *Original.*

PLATE 3.

Forms of teeth in different genera of Sharks. *Agassiz.*‡

PLATE 4.

The same; the view of the teeth of the *Scymnus* is original.

* Cuvier and Valenciennes, Histoire Naturelle des Poissons, 4to. 1828, et seq.
† Vergleichende Anatomie der Myxinoiden, 4to. 1835.
‡ Poissons Fossiles, fol. 1836.

PLATE 5.

Fig. 1.—A vertical section of the under jaw of the Lamna, shewing a vertical row of eight teeth and their various degrees of calcification. *Fig.* 2. A highly magnified view of the primary and secondary branches of a dentinal tube of the tooth of a Lamna. *Fig.* 3. Fossil tooth of *Lamna elegans*. *Fig.* 4. Front view of the same tooth. *Fig.* 5. Fossil tooth of an *Otodus*. *Original.*

PLATE 6.

Longitudinal section, magnified, of a fossil tooth of *Lamna elegans*, shewing the ramifications of the vascular canals in the vaso-dentine, which constitutes the body of the tooth: the hard or unvascular dentine covers it like enamel. *Original.*

PLATE 7.

A section of the preceding tooth, magnified 500 linear times, showing the subparallel dentinal tubes in the hard peripheral layer of dentine, and the reticulate dentinal tubes between the vascular canals *a* & *b*. *Original.*

PLATE 8.

Fig. 1.—Under surface of the head of the Saw-fish (*Pristis antiquorum*), showing the rostral and maxillary teeth, $\frac{1}{8}$th nat. size. *Fig.* 2. Some of the upper and lower maxillary teeth. *Fig.* 3. A section of the part of the rostrum and of one tooth, *a*. *b*, ossified part of rostrum forming its socket; *c*, canal for vessels supplying the teeth; *d*, medullary cavity of rostral cartilage; *e*, granular skin or shagreen. *Fig.* 4. A single rostral tooth; *a*, its posterior groove, into which the process at the opening of the socket fits. *Fig.* 5. Transverse section of the tooth. *Original.*

PLATE 9.

Longitudinal section of a rostral tooth under a low power, showing the course and anastomoses of the vascular canals. *Fig.* 2. A transverse section of the tooth, magnified 350 linear times, shewing the reticular dentinal tubes continued from the vascular canals, and the clear interspaces which define each system of canals. *Original.*

PLATE 10.

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PLATE 11.

Fig. 1.—Portion of fossil jaw with vertical rows of six teeth of the *Hybodus grossiconus*. *Fig.* 2. Lower jaw and teeth of the *Cestracion Philippii*. *Fig.* 3. Detached grinding tooth, showing the contracted base of attachment of *Cestracion*. *Fig.* 4. The same with a section removed from the crown, showing the orifices of the vascular canals. *Original.*

PLATE 12.

A longitudinal section of a grinding tooth of *Cestracion Philippii*, magnified 150 linear, showing the general course of the vascular canals and of the calcigerous or dentinal tubes which radiate therefrom. *Original.*

PLATE 13.

A portion of the same section magnified 350 linear, showing the sub-parallel tubes in the hard peripheral dentine, and the reticulate disposition of the tubes in the interspaces of the canals. *Original.*

PLATE 14.

Five teeth in natural relative position of an allied extinct cartilaginous fish (*Acrodus nobilis*), nat. size; and half of a vertical section of one of the teeth, magnified 30 linear diameters. *Original.*

PLATE 15.

Portion of a vertical section of a tooth of *Acrodus nobilis*, more highly magnified: *a*, large vascular canals at the base of the tooth; *b*, smaller vascular canals in the body of the tooth; *c*, calcigerous or dentinal tubes radiating from the vascular canals; *d*, the sub-parallel tubes in the outer layer of hard dentine; *e*, modified enamel. *Original.*

PLATE 16.

Fig. 1.—Section of a dried head of an Eagle-ray (*Aetobates Narinari*). *Fig.* 2. A section of the enamel and hard dentine of the tooth of *Acrodus nobilis*, magnified 400 linear times; showing the continuation of the fine terminal branches of the dentinal tubes into the so-called enamel. *Fig.* 3. One of the medullary canals, with its radiating system of calcigerous tubes, divided more or less obliquely from the body of the tooth

magnified 400 linear times. *Fig.* 4. A portion of the middle of the enamel, magnified 700 linear diameters. *Original.*

PLATE 17.

Fig. 1.—Side view of a tooth of the *Ptychodus latissimus*. *Fig.* 2. Grinding surface of ditto. *Fig.* 3. Side view of a tooth of the *Psammodus magnus*. *Original*. *Fig.* 4. The grinding surface of four teeth of the *Strophodus*. *Agassiz*.

PLATE 18.

A longitudinal vertical section of the tooth of the *Ptychodus decurrens*: magnified to the scale shown by the figure of the nat. size. *Original.*

PLATE 19.

Fig. 1.—Part of a longitudinal section of ditto: magnified 230 linear times. *Fig.* 2. Part of a transverse section, magnified 500 linear times. *Original.*

PLATE 20.

Half of a vertical section of the tooth of *Psammodus magnus*: magnified 50 diameters. *Original.*

PLATE 21.

The upper portion is the peripheral border of a vertical section of the same tooth, demonstrating the closure of the medullary canals by calcification of their contents, close to that border; which process of consolidation is proved by sections of teeth in different stages of abrasion to have gone on progressively with such stages. The lower portion is a transverse section of two medullary canals, near their point of anastomosis: both magnified 500 diameters. *Original.*

PLATE 22.

Fig. 1.—Part of lower jaw with the dental plates of the *Cochliodus contortus*. *Agassiz*. *Fig.* 2. One of the dental plates of the *Ceratodus gibbus*. *Agassiz*. *Figs.* 3, 4 & 5, different views of the teeth of the *Petalodus Hastingsiæ*. *Original*. *Fig.* 6. Upper surface of part of a tooth of the *Ctenodus cristatus*. *Agassiz*. *Fig.* 7. Vertical section of the same. *Agassiz.*

PLATE 23.

Fig. 1.—Teeth of the upper jaw of the *Rhina*. *Fig.* 2. Teeth of the lower jaw of the same. *Fig.* 3. A single tooth of the same, magnified. *Original.*

PLATE 24.

Fig. 1.—Longitudinal section of a tooth of the *Rhina*. *Fig.* 2. A section of the exterior enamel-like layer, showing the undulated and branched terminations of the dentinal tubes. *Original.*

PLATE 25.

Fig. 1.—Jaws and teeth from behind of an Eagle-ray (*Myliobates aquila*). *Agassiz*. *Fig.* 2. A portion of the dental series of the upper jaw of the *Rhinoptera marginata*, showing a variety in the subdivision of the teeth next the right side of the broad middle row. *Original*. *Fig.* 3. Side view of a single dental plate of an *Aëtobates Narinari*. *Fig.* 4. Lower jaw and dental series of *Aëtobates Narinari*, from behind.

PLATE 26.

Vertical and longitudinal section of a tooth or dental plate of the *Myliobates Aquila*: *a*, processes or ridges for the attachment

of the base ; *b*, parallel vertical medullary canals ; *c*, calcigerous tubes radiating therefrom.

PLATE 27.

Transverse section of portions of two contiguous teeth, showing *a*, their uniting suture ; *b*, area of medullary canal ; *c*, dentinal tubes radiating therefrom, (with an enlarged outline at the side) ; *d*, intermediate osseous or cemental tissue binding together the denticles which form the compound tooth. *Original.*

PLATE 28.

Fig 1. — The dental plate of the upper and lower jaw of the *Southern Chimæra*, (*Callorhynchus australis*). *Fig.* 2, Side view of the same. *Fig.* 3. Vertical longitudinal section of the same. *Original.* *Fig.* 4. Outer side of small anterior and large posterior or lateral dental plates of the upper jaw of the *Chimæra monstrosa*. *Fig.* 5. Inner side of the same. *Fig.* 6. Outer side of the single dental plate of the lower jaw of the same. *Fig.* 7. Inner side of the same. *Fig.* 8. Horizontal section of the same. *Agassiz.* *Fig.* 9. Part of the lower jaw of a Shark (*Galeus*) pierced by the barbed caudal spine *b*, of a Sting-ray (*Trygon*,) showing the effect of the wound of the dental matrix, in the teeth which have advanced in their revolving course over the jaw. *a*, one of these teeth erect in the row which is in use. *André*.*

PLATE 29.

Fig. 1.—A section of the dental plate of a *Chimæra* across the medullary canals, magnified 50 diameters by reflected light. *Fig.* 2. A section a little obliquely to the course of the medullary canals. *Original.*

* Philosophical Transactions, 1678.

PLATE 30.

Fig. 1.—A portion of a fossil jaw of a *Lepidotus Mantellii*. *Fig.* 2. Molars and alveoli of the prehensile intermaxillary teeth of *Placodus Andriani*. *Fig.* 3. Detached prehensile intermaxillary tooth of ditto. *Fig.* 4. Side view of dentary piece of the lower jaw of ditto. *Agassiz.*

PLATE 31.

Part of vertical longitudinal section of a tooth of the *Lepidotus Mantellii*, magnified 300 linear diameters. *Original.*

PLATE 32.

Vertical section of a tooth of a *Sphærodus* magnified 50 linear diameters. *Original.*

PLATE 33.

Fig. 1.—Grinding surface of a tooth of the *Sphærodus gigas*. *Fig.* 2. Vertical section of the same. *Fig.* 3. A portion of the section in *Pl.* 32, magnified 500 linear diameters. *Original.*

PLATE 34.

Fig. 1.—Part of fossil vomer with teeth of *Pycnodus rugulosus*. *Fig.* 2. Vomerine teeth of *Pycnodus Bucklandi*. *Fig.* 3. Side view of fragment of a vomer of *Pycnodus dydimus*. *Fig.* 4. Side view of lower jaw and teeth of *Gyrodus jurassicus*. *Fig.* 5. Upper view of the same. *Fig.* 6. Side of single tooth of *Gyrodus rugulosus*. *Fig.* 7. Grinding surface of ditto. *Fig.* 8. Basal surface of ditto. *Agassiz.*

PLATE 35.

Fig. 1.—Portion of jaw of a recent Sauroid (*Lepidosteus osseus*), showing the large conical laniariform teeth, and the

smaller ones in the interspaces, with the bases of two of the larger teeth showing the convergence of the peripheral fissures towards the centre of the tooth. The end view of the section shows the alveolar groove and its outer parapet. *Fig.* 2. Parts of the lower jaw of a fossil Sauroid (*Holoptychius Hibbertii, Agas. Rhizodus mihi*): *a*, implanted and anchylosed base of one of the large teeth. *Original.*

PLATE 36.

One of the large laniary teeth of the natural size, with a longitudinal section removed from the base, and a magnified view of the section: *Rhizodus Hibbertii, Original.* (A transverse section shows the radiations of the divisions of the pulp-cavity continued into the cylindrical processes of the base of the tooth, according to the labyrinthic type of structure.)

PLATE 37.

A portion of a transverse section of the crown of one of the large laniary teeth of *Rhizodus Hibbertii.* These teeth and the analogous ones of the recent Sauroid fishes differ from the teeth of the *Labyrinthodon* in the larger proportion of the crown in which the pulp cavity is simple, as in the figure. *Original.*

PLATE 38.

Fig. 1.—Lower jaw and dental masses of the Globe-Fish (*Diodon Hystrix*). *Fig.* 2. Portion of the same cleft vertically near the symphysis; *a*, the last formed plates of the posterior tooth: *b*, the same of the anterior tooth: *c*, the intervening vascular canal. *Fig.* 3. A portion of a section of the posterior tooth magnified 600 linear diameters: *a*, intervening layer of osseous or cemental substance; between *b* and *c* the dentinal layers of the compound tooth. *Original.*

PLATE 39.

Fig. 1. Jaws of the *Tetrodon lineatus: a*, posterior lamelliform teeth of upper jaw. *Fig.* 2. Portion of a vertical section of the posterior tooth of *Diodon Hystrix* magnified 120 linear diameters.

PLATE 40.

Fig. 1.—Side view of intermaxillary and mandibular teeth of a File-Fish (*Balistes forcipatus*). *Fig.* 2. *a*, upper, *b*, lower pharyngeal bones and teeth, left side, of *Balistes forcipatus. Fig.* 3. Outside view of right intermaxillary, showing the alveoli for the union by double gomphosis of the outer teeth. *Fig.* 4. Inside view of the same, showing the inner teeth. *Fig.* 5. Successional intermaxillary teeth exposed: *a*, osseous tubercle which supported the tooth in place: *b*, the end of the successional tooth which has caused the absorption of the osseous tubercle of the second intermaxillary tooth. *Fig.* 6. Successional teeth of the inner row exposed. *Fig.* 7. Inner surface of teeth of the lower jaw. *Original.*

PLATE 41.

Fig. 1.—Upper and lower jaws and teeth of a Sea-Bream (*Dentex Argyrozona*), *Fig.* 2. Inside view of those of the left side: *a*, intermaxillary: *b*, maxillary: *c*, dentary: *d*, articular.

PLATE 42.

Fig. 1.—Upper view of the teeth of the lower jaw of *Sargus rufescens. Fig.* 2. Front view of incisors of a young *Sargus*

Vetula. *Fig.* 3. Upper and lower jaws and teeth of a Gilt-Head (*Chrysophrys australis*). *Original.*

PLATE 43.

Fig. 1.—Vertical section of a tooth of *Microdon radiatus* magnified 50 linear diameters. *Fig.* 2. A section, in the direction indicated by the lines, of an incisor of *Sargus rufescens*: *a*, dentine; *b*, modified enamel: *c*, clear intermediate space (calcified preformative membrane); *d*, osteo-dentine. *Original.*

PLATE 44.

Fig. 1.—Four of the premandibular teeth of the *Acanthurus nigricans* magnified 30 linear diameters: a reduced view. *Original.* *Fig.* 2. A vertical longitudinal section of the continuous parts of four of the lamelliform teeth of the *Phyllodus toliapicus*: *a*, the osseous basis; *b*, the dentine; *e*, the enamel. *Original.* *Fig.* 3. Two of the teeth of a *Chætodon*: *a*, front view of the subtransparent tooth; *b*, side view of the longitudinal section, showing the pulp-cavity (*v. Born*)*. *Fig.* 4. A vertical section of the right intermaxillary bone of the *Chrysophrys*: *a*, the posterior oval triturating dental plate; *b*, the germ of its successor in the alveolus of reserve; *c*, the rudiment of the third generation of the same tooth; the line from letter *b* shows the tract of communication, still open, between the second and third alveolus. (*Cuvier and Val.*) *Fig.* 5. The tooth of a Pike in progress of formation, with its capsule and a portion of the surrounding gum: *a*, the apex of the calcified tooth; *b*, the external membrane of the gum reflected around the base of the tooth to form its capsule; *c*, the dentinal pulp; *d*, the nerve of the pulp (*v. Born*); *Fig.* 4. The right premandibular bone of a young Pike, dissected to show the nerves of the tooth, viewed from the inner side: *a*, branches of the third division of the fifth pair of nerves; *b*, branchlets of the same to the integuments on the outside of the jaw; *c*, twigs for the teeth; one is sent off to each tooth; *d*, branch which perforates the bone, supplies that part and the outer integuments. (*v. Born.*)

* Heusinger's Zeitschrift, Bd. i. 1827.

PLATE 45.

Fig 1.—Inside view of the intermaxillary bone and teeth of a Wrasse (*Labrus, Linn., Cossyphus, Cuv.*) *Fig.* 2. Inside view of premandibular bone and teeth of ditto. *Fig.* 3. Pharyngeal bone and teeth of the southern Gilt-Head, (*Chrysophrys australis*). *Fig.* 4. The two upper pharyngeal bones and teeth of a large species of Wrasse (*Labrus*). *Fig.* 5. Pharyngeal bone and teeth of *Chrysophrys aurata.* *Fig.* 6. A vertical section of a pharyngeal tooth of a *Chrysophrys.* *Original.*

PLATE 46.

Fig. 1.—A vertical section of a pharyngeal bone and teeth of a *Labrus*: *a*, teeth in use; *b*, successional teeth. *Fig.* 2. A magnified view of a similar section of a single tooth and its socket of a *Labrus.* *Original.*

PLATE 47.

Fig. 1.—Upper surface of the dental plate of an extinct Ganoid Fish (*Phyllodus*). *Fig.* 2. Under surface of the same. *Fig.* 3. Upper surface of a median dentigerous bone of the *Pisodus Owenii.* *Ag.* *Original.*

PLATE 48.

Fig. 1.—A row of intermaxillary teeth of the *Hypostoma*. *Fig.* 2. Four intermaxillary teeth of the *Rhynelepis*. *Fig.* 3. Five intermaxillary teeth of the *Acanthicus*. *Fig.* 4. Reduced view of the bones of the upper and lower jaws of the *Sudis gigas*; *a*, intermaxillary; *b*, maxillary; *c*, palatine; *d*, pterygoid; *e*, vomer; *f*, premandibular; *g*, articular; *h*, surangular; *i*, angular. *Fig.* 5. Teeth of the upper jaw of *Sudis gigas: f*, *f*, basisphenoid. *Fig.* 6. Lingual bone with anterior and posterior groups of teeth, (*Sudis gigas*). *Fig.* 7. Dental system of *Osteoglossum*: *a*, intermaxillaries; *b*, maxillaries; *c*, palatines; *d*, vomer, *e*, lingual bone. *Fig.* 8. Teeth *in situ* of *Serrasalmo*. *Fig.* 9. Intermaxillary, maxillary, palatine, vomerine, premandibular, and lingual teeth of a salmon. (*Salmo salar.*) *Fig.* 10. Similar view of the teeth of *Myletes*. *Agassiz.**

PLATE 49.

Fig. 1.—Intermaxillary teeth of a Parrot-Fish (*Scarus muricatus*). *Fig.* 2. Skull of a *Scarus* with two of the intermaxillary teeth, on each side, prominent and pointed. *Fig.* 3. Premandibular bone, cleft vertically near the symphysis, of *Scarus muricatus: a*, one of the last-formed denticles; *b*, dentiparous cavity. *Original.*

PLATE 50.

A longitudinal section of a single denticle of the *Scarus muricatus*: magnified. *Original.*

PLATE 51.

Fig. 1.—Vertical section of an upper pharyngeal bone and teeth of *Scarus muricatus*. *Fig.* 2. Dentigerous surface of the two upper pharyngeal bones of ditto. *Fig.* 3. Lower pharyngeal bone and teeth of ditto. *Original.*

* Spix, *Pisces Brasilienses*, 4to.

PLATE 52.

Fig. 1.—Vertical section of five pharyngeal teeth of *Scarus muricatus, nat. size*. *Fig.* 2. Section of a single tooth magnified 150 linear diameters, (reduced view). *a*. Osteo-dentine: *b*. dentine: *c*. enamel: *d*. cement. *Fig.* 3. Termination of a single dentinal tube, magnified 700 linear diameters. *Original.*

PLATE 53.

Fig. 1. Portion of under jaw of the Barracuda Pike (*Sphyræna Barracuda*), *a*, *a*, orifices of concealed alveoli of successional teeth. *Fig.* 2. Longitudinal section of apex of one of the teeth, magnified 250 linear diameters. *Original.*

PLATE 54.

A longitudinal section of a fossil Sphyrenoid Fish (*Sphyrænodus priscus, Agassiz*; *Dictyodus, mihi*): magnified 150 linear diameters.

PLATE 55.

A part of a longitudinal section of the tooth of the *Saurocephalus lanciformis*; magnified 250 linear diameters. A detached tooth and two *in situ* are added of the natural size. *Original.*

PLATE 56.

Fig. 1.—A portion of the lower jaw of the Angler (*Lophius piscatorius*). *a*, *a*. Outer row of teeth: *b*, *b*. Inner row of teeth; one of these is bent down,

and the outline shows it as restored by the spring of the elastic ligaments at the base. *Fig.* 2. Vomerine and premandibular teeth of the broad-nosed Eel (*Anguilla latirostris*). *Fig.* 3. Skull and teeth of a smaller specimen of the same *Yarrell.* *Fig.* 4. Skull and teeth of *Muræna anguiceps.* *Fig.* 5. Jaws and teeth of *Muræna tigrina: a,* vomerine teeth: *b,* maxillary teeth. *Original.*

PLATE 57.

Fig. 1.—Lower pharyngeal teeth, *in situ,* of a Barbel (*Bar vulgaris*) *a,* a probe passed from the mouth, through the pharynx; *b, protractor pharyngis*; *c, retractor pharyngis.* *Original.* *Fig.* 2. Separate lower pharyngeal bone and teeth of the Barbel. *Yarrell.* *Fig.* 3. Outer row of pharyngeal teeth of *Schizothorax esocinus.* *Fig.* 4. Lower pharyngeal bone and teeth of the Roach (*Leuciscus rutilus*) *Yarrell.* *Fig.* 5. Pharynx of the Tench (*Tinca vulgaris*), opened from below, and the two pharyngeal bones and teeth divaricated; *a,* the occipital pharyngeal: *b,* the æsophagus. *Fig.* 6. A similar view of the pharynx of a Carp (*Cyprinus Carpio*); *a,* the occipital pharyngeal plate; *b,* part of a cell in the fleshy pharynx cut open, to show; *c,* the germ of a pharyngeal tooth. *Fig.* 7. One of the lower pharyngeal bones and teeth with part of the other bone anchylosed to it, of an old Carp. *Fig.* 8. Basal pulp-cavity of a large pharyngeal tooth, Carp. *Original.*

PLATE 58.

Fig. 1.—Portion of a pharyngeal tooth and its formative pulp, showing the peripheral cells of the latter and the connection of the tubes of the calcified part with the nuclei of the cells. The areolar character of the calcifying surface of the pulp is shown at the lower corner of the figure. *Fig.* 2. Base of the pharyngeal tooth of a Barbel. *Original.*

PLATE 59.

Fig. 1.—Side view of the skull and teeth of the *Lepidosiren* (*Protopterus*) *annectens.* *Fig.* 2. Front view of the same. *Fig.* 3. Oral surface of the intermaxillary, maxillary and mandibular teeth of *ditto.* *Fig.* 4. Reduced view of a vertical section of maxillary dental plate, magnified 120 diameters, of the *Protopterus annectens.*

PLATE 60.

Fig. 1.—Upper and lower jaws and teeth of the Wolf fish, (*Anarrhichas Lupus*). *a,* intermaxillary: *b,* maxillary: *c,* palatine. *Fig.* 2. Premandibular bone and teeth cleft vertically near the symphysis of ditto. *Original.*

PLATE 61.

Fig. 1.—Lower jaw and teeth of Wolf-fish. *Fig.* 2. Oral surface of, *a,* intermaxillaries, *b,* palatines, and, *c,* vomer, with their teeth. *Original.*

PLATE 62.

Fig. 1.—Side view of the skull and teeth of *Menopoma Alleghanniense.* *Fig.* 2. Base of skull with intermaxillary, maxillary and vomerine teeth of ditto. *Fig.* 3. Skull and teeth of the *Proteus anguinus.* *Fig.* 4. Base of skull of *Axolotes mexicanus*; *a,* intermaxillary; *b,* maxillary; *c,* vomer; *d,* pterygoid. *Fig.* 5. Skull and teeth of *Siren lacertina.* *Fig.* 6. Base of skull of ditto. *Fig.* 7. Base of skull of *Amphiuma tridactylum.* *Fig.* 8.

Base of skull of *Rana esculenta*. *Fig.* 9. Skull and teeth of *Triton cristatus*. *Fig.* 10. *a*, Intermaxillary teeth; *b*, maxillary teeth; *c*, vomerine teeth of *Rana pipiens*. *Fig.* 11. Cranium of *Plethodon glutinosus*; *a*, intermaxillary teeth; *b*, maxillary teeth; *c*, vomerine teeth; *d*, pterygoid teeth; *e*, sphenoid teeth. *Cuvier,* and Original.*

PLATE 62. A.

Detached teeth of the following species. *Fig.* 1. *Dendrodus biporcatus*: *a*, summit of the tooth. (This is a Sauroid Fish.) *Fig.* 2. *Labyrinthodon conicus*. *Fig.* 3. *Anisodon gracilis*. *Fig.* 4. *Cladeiodon Lloydii*. *a*, side view: *b*, back view. *Fig.* 5. *Iguanodon Mantellii: a*, outer side; *b*, inner side; *c*, lateral view; *d*, an old tooth, fang complete and remains of pulp-cavity exposed; *e*, magnified view of marginal serrations. *Fig.* 6. *Megalosaurus, Bucklandi*. *a*, side view; *b*, back view; *c*, magnified view of serrated edge. *Fig.* 7. *Palæosaurus platyodon*. *Fig.* 8. *a, b. Hylæosaurus(?)*. *Fig.* 9. *Goniopholis crassidens*. *Fig.* 10. *a, b, Crocodilus* (*Suchosaurus*) *cultridens*.

PLATE 62. B.

Fig. 1. Transverse section of the tooth of the *Dendrodus biporcatus*, nat. size. *Fig.* 2. A portion of the same, magnified 120 linear diameters, *a*, the large central vascular or pulp canals. *Fig.* 3. A transverse section of the same tooth one third from its summit. *Fig.* 4. Peripheral part of the section, magnified 500 linear diameters; *a*, terminal branches of medullary radiating canals; *b*. thin inflected layer of cement.

* Ossemens Fossiles, 4to. 1825, vol. v. pt. ii.

PLATE 63.

Fig. 1.—Tooth of *Labyrinthodon* (*Mastodonsaurus*) *Jaegeri*, nat. size. *Jaeger*. *Fig.* 2. Two teeth of *Phytosaurus cubicodon*. *Jaeger*. *Fig.* 3. Part of jaw and teeth of *Phytosaurus cylindricodon: a*, socket of large anterior tooth; *b*, tooth with pulp-cavity exposed; *c*, old tooth with new one rising through the pulp-cavity. *Fig.* 4. Three teeth of *Phytosaurus cylindrocodon*. *Fig.* 5. Tooth and alveolar wall of *Nothosaurus*. *Jaeger.**

PLATE 63. A.

Fig. 1.—Side view of part of upper jaw and teeth of *Labyrinthodon leptognathus*. *Fig.* 2. Side of part of under jaw of ditto. *Figs.* 1· & 2·. Teeth of ditto, nat. size, they are marked * in figs. 1 & 2. *Fig.* 3. Under surface of fig. 1. *a* large anterior tusk; *b*. smaller serial teeth of upper jaw; *c*, vomerine bone and teeth; *d*, anterior palatine opening; *e*, posterior palatine opening. *Fig.* 4. Fore part of mandibular ramus of *Labyrinthodon pachygnathus: a*, large anterior tusks; *b*, serial teeth. *Fig.* 5. Upper surface of ditto. *Fig.* 6. Skull and teeth of *Pterodactylus crassirostris*. *Fig.* 7. Two of the supposed teeth of the *Pterodactylus macronyx*. *Fig.* 8. Inner view of part of upper jaw of a Monitor Lizard (*Varanus striatus*). *a*. remains of sockets of detached teeth. *Fig.* 9. Part of lower jaw of *Varanus variegatus*, showing the groups of two or three successional teeth, behind the large ones in place. *Original.*

PLATE 63. B.

Fig. 1.—A transverse section near the summit:—*fig.* 2, the same near the base

* Fossile Reptilien in Wurtemberg. 4to. 1828.

of the crown of a tooth of the *Labyrinthodon leptognathus*; both magnified 30 linear diameters. *Original.*

PLATE 64.

Portion of a transverse section of the great tooth of the *Labyrinthodon* (*Mastodonsaurus*) *Jaegeri*, magnified 30 linear diameters. *a*, Pulp-cavity; *b*, dilated termination of one of the radiated fissures; *c*, inflected fold of cement; *d*, termination of the fold. *Original.*

PLATE 64. A.

Fig. 1.—A reduced view of a section through the middle of the crown of the same tooth similarly magnified. *a*, Radiating fissures from the pulp-cavity; *b*, converging folds of ossified capsule; *b'*, shorter folds of ditto. *Fig.* 2. A single lobule of dentine, magnified 350 linear diameters. *a*, basal subdivision of pulp-fissure; *b*, thin layer of cement. *Fig.* 3. Terminations of two dentinal tubes, 500 linear diameters. *Original.*

PLATE 64. B.

Fig. 1.—Anterior tusk, lower jaw of *Labyrinthodon pachygnathus*. *Fig.* 2. Half of the transverse section across the dotted line in fig. 1, magnified 50 diameters (a reduced view). *a*, Fissures radiating from pulp-cavity; *b*, converging folds of ossified capsule; *c'* shorter folds of ditto. *Fig.* 3. Transverse section of base of tooth of *Ichthyosaurus communis*. *a*, Fissures radiating from pulp-cavity; *b*, external cement. *Originol.*

PLATE 65.

Fig. 1.—Base of cranium and teeth of a *Cæcilia* (*Epicrium bivittatum*). *Fig.* 2. Side view of skull and teeth of ditto. *Fig.* 3. Side view of skull and teeth of *Amphisbæna alba*. *Fig.* 4. Base of cranium of ditto. *Fig.* 5. Half of base of cranium of *Ophisaurus ventralis*. *Fig.* 6. The same of the Tiger-boa (*Python tigris*). *Fig.* 7. Side-view of the skull of the Tiger-boa; *a*, intermaxillary; *b*, maxillary; *c*, palatine; *d*, pterygoid; *e*, tympanic pedicle; *f*. mastoid. *Fig.* 8. Skull and teeth of a Rattle-snake, (*Crotalus horridus*); *b*, maxillary bone and poison fang; *c*, palatine; *d*, pterygoid teeth. *Fig.* 9. Maxillary, palatine and pterygoid bones and teeth: a bristle is passed through the orifices and canal of the poison-fang. *Fig.* 10. Base of poison-fang. *Fig.* 11. Longitudinal section of poison fang; *a*, pulp-cavity, *b b*, poison-canal. *Fig.* 12. Dissected head of *Trigonocephalus lanceolatus*: *a*, base and common stem of the pinnate lobes of poison-gland; *b b*, capsule of the gland laid open; *c*, poison duct, the dotted line shows its course to the fang; *d*. nasal salivary gland; *e*, labial mucous glands. *Fig.* 13. Base of skull and lower jaw of a Cobra-di-capello; *a*, intermaxillary; *b*, maxillary and poison-fang; *d*, pterygoid with non-venomous teeth. *Fig.* 14. *Hydrophis striatus*: *b*, maxillary teeth. *Fig.* 15. Dissected head of *Hydrophis schistosa*: *a*, anterior temporal muscle; *b*, middle temporal muscle; *c*, posterior temporal muscle; *d*, digastric; *e*, articulo-maxillary tendon which expands, at *f*, upon the sac of the poison-gland. *Cuvier* and *Cantor.*

PLATE 65. A.

Fig. 1.—Natural size and magnified transverse section of a poison-fang; *a*, pulp-cavity; *b b*, dentine; *c*, thin exterior cement uniting the folds that include the poison-canal. *Fig.* 2. The united folds of the previous section, magnified 500 linear diameters; *c*, cement. *Original.*

PLATE 65 B.

Fig. 1.—Half of a transverse section of the tooth of a Python, magnified 120 linear times; *a*, pulp-cavity; *b*, peripheral part of dentine; *c*, enamel. *Fig.* 2. Dentinal tubes of ditto, magnified 500 linear diameters. *Fig.* 3. Section of the base of a tooth of the *Iguana tuberculata*, magnified 350 linear diameters. *Original.*

PLATE 66.

Fig. 1.—*Uromastyx.* 1'. Inside view of two of the anchylosed teeth, and their transverse section. *Fig.* 2. *Lacerta ocellata.* 2', magnified tooth and transverse section. *Fig.* 3. *Chameleo bifurcus.* 3'. Inside view of an anchylosed tooth. *Fig.* 4. Gecko (*Thecodactylus lævis*). 4'. Single tooth. *Fig.* 5. Lower jaw of a large species of *Scincus.* 5". One of the teeth magnified. *Cuvier. Fig.* 6. *Thorictes Dracœna*, upper and lower jaws. *Fig.* 7. *Cyclodus nigroluteus*, *b b*, successional teeth. In each of the above figures, *a*, is the intermaxillary; *b*, maxillary; *c*, dentary; *d*, articular; *e*, angular; *f*, surangular; *g*, coronoid; *h*, splenial or opercular. *Original.*

PLATE 67.

Fig. 1.—Longitudinal section of a tooth and portion of the alveolar parapet of a Monitor Lizard (*Varanus*), magnified 250 linear diameters. *a*, Enamel; *b*, dentine; *c*, bone; *d*, vascular canals. *Fig.* 2. A small portion from the exterior of the same tooth, magnified 500 linear times. *a*, Enamel; *b*, dentine, showing the small lateral branches of the tubes.

PLATE 68.

Fig. 1.—A greatly reduced view of the fossil jaws of the *Mosasaurus Hoffmanni*: *b*, superior maxillary; *d*, *d*, pterygoid bones and teeth. *Fig.* 2. Half the base of the skull of the *Iguana tuberculata*: *a*, intermaxillary; *b*, maxillary; *c*, palatine; *d*, pterygoid or ento-pterygoid; *e*, transverse or exo-pterygoid bones; *f*, process of ento-pterygoid; *g*, basi-sphenoid; *h*, basi-occipital. *Fig.* 3. Lower jaw of *Varanus crocodilinus*: *c*, dentary; *d*, articular; *f*, sur-angular; *g*, coronoid; *h*, splenial. *Fig.* 3'. A single tooth magnified, of the same. *Fig.* 4. Inside view of lower jaw of the *Varanus niloticus.* 4'. A single tooth magnified, of the same. *Fig.* 5. Outer side of crown of tooth of *Pliosaurus.* 5 & 5". The two other sides of the same trihedral crown.

PLATE 69.

Fig. 1.—Portion of a transverse section of the crown of the maxillary tooth of the *Iguana tuberculata*: *a*, enamel, *b*, dentine; magnified 350 linear diameters. *Fig.* 2. The termination of a single dentinal tube, magnified 500 linear diameters. *Fig.* 3. A reduced view of half a transverse section of a maxillary tooth of the Mosasaurus, magnified 230 linear diameters. *a*, enamel; *b*, dentine. *Original.*

PLATE 70.

Fig. 1.—Tooth of the *Iguanodon*, outer side. *Fig.* 2. The same, inner side. *Fig.* 3. Fragment of an old tooth much worn down. *Fig.* 4. Tooth of a young *Iguanodon.* *Fig.* 5. Crown of an incompletely formed successional tooth of *Iguanodon.* *Fig.* 6. Skull of the *Iguana cornuta.* *Fig.* 7. Inside view of lower jaw of ditto, showing the pleurodont mode of attachment of the teeth and the germs of their successors. *Fig.* 8. Reduced view of portion of the lower jaw of the *Mega-*

losaurus Bucklandi: a, successional teeth *b*, outer alveolar wall; *c*, transverse partitions. *Fig.* 9. Edge-view of a tooth, with portion of jaw, of the *Megalosaurus*. *Fig.* 10. Side view of the same tooth, with dotted outline of pulp-cavity. *Fig.* 11. Transverse section of ditto. *Buckland.*

PLATE 70. Æ.

ig. 1.—Nat. size, of *Fig.* 2, part of a transverse section of the tooth of the *Megalosaurus*, magnified 250 diameters. *Fig.* 3. A peripheral portion of the same, magnified 500 linear diameters: *a*, dentine; *b*, boundary cells between the dentine and *c*, the enamel. *Original.*

PLATE 71.

)utline of a transverse section of the tooth of the *Iguanodon*, and a magnified view of the moiety including the pulp cavity *a*; *b*, the vaso-dentine; *c*, stratum of minute cellules. The opposite part of the section is composed of hard unvascular dentine. *Original.*

PLATE 72.

Fig. 1.—A portion of jaw, with two teeth, of the *Leiodon anceps: a*, crown; a^1, anchylosed base; *b*, fractured base of crown. 1^1 Transverse section of crown. *Fig.* 2. Fractured anchylosed base of the same. *Fig.* 3. Crown of the tooth of the *Polyptychodon continuus*. *Fig.* 4. Front and back views of the crown of a tooth of the *Polyptychodon interruptus*. 4· Outline of transverse section of same tooth. *Fig.* 5. Outline of transverse section of the tooth of the *Pliosaurus*. *Original.*

PLATE 73.

Fig. 1.—A tooth of *Ichthyosaurus intermedius*. *Fig.* 2. A tooth of *Ichth. lonchiodon*, with a transverse section of the grooved base below. *Fig.* 3. A tooth of *Ichth. platyodon*, viewed edge-wise with an outline of the transverse section of the crown. *Fig.* 4. A tooth of *Ichth. communis*, with an outline of the transverse section of the crown. *Fig.* 5. A tooth of *Ichth. tenuirostris*. *Fig.* 6. A tooth of the *Ichth. platyodon*, showing the cavity *a*, produced by the pressure of a new tooth. *Fig.* 7. A section through the tooth and lower jaw of the *Ichth. communis*, showing the young tooth, *c*, which has penetrated into the cavity formed by progressive absorption in the fang or base of the old tooth. *a*, remnant of the pulp-cavity; *b*, consolidated base; *d*, is a section of the dental canal. *Fig.* 8. Section of a tooth of the *Ichth. communis* showing *a*, remains of the pulp-cavity in the crown, filled by spar; *b*, ossified base. *Fig.* 9. Portion of alveolar groove with indications of septa. *Fig.* 10. Tooth of the *Plesiosaurus macrocephalus*. *Original.*

PLATE 73 A.

Fig. 1.—Longitudinal section of the crown of the tooth of the *Ichthyosaurus intermedius*, magnified 250 linear diameters. *Fig.* 2. A peripheral portion of the same section, magnified 400 linear diameters: *a*, dentine; *b*. enamel. nat. size. *Original.*

PLATE 74.

Fig. 1.—Longitudinal section of the apex of the crown of the tooth of the *Plesiosaurus Hawkinsii*, magnified 250 linear diameters. *Fig.* 2. A peripheral portion of the same section, magnified 700 linear diameters. *Original.*

PLATE 75.

Fig. 1.—A tooth of the *Crocodilus biporcatus*, with the size and form of the

pulp-cavity indicated by a dotted line. *Fig.* 2. Tooth of the *Gavialis gangeticus: a*, base absorbed and penetrated by, *b*, a successional tooth; *c*, germ of a third tooth. *Fig.* 3. Back part of the series of teeth of the lower jaw of the *Alligator niger*, with the inner wall of the alveolar groove removed showing the absence of partitions, and the germs of the successional teeth. *Fig.* 4. Middle part of the series of teeth of the same species, exposed by removal of the outer alveolar wall, showing the partitions forming here distinct sockets, from which the teeth are raised to show the germs of successional teeth, and the dentiparous cavities. *a*, a tooth turned round to show the effect of the new germ upon its base; *b*, the shell of an old tooth and two successors. *Fig.* 5. The root of an old tooth of the Black Alligator, penetrated by its successor. *Fig.* 6. Base of the same. *Fig.* 7. Opposite end from which the crown has been broken away, showing the apex of that of the new tooth. *Original.*

PLATE 75 A.

Fig. 1.—Skull of an Alligator. *Fig.* 2. Skull of a Crocodile. *Fig.* 3. Skull of a Gavial. *Fig.* 4. Skull of a Teleosaur. *Fig.* 5. *a*, *b*, two views of a tooth of the *Marmorosaurus obtusus: c*, interrupted ridges of enamel on the base of the crown, magnified. *Fig.* 6. *a*, side view; *b*, edge view of the tooth of *Hylæosaurus*(?). *Fig.* 7. *a*, side view; *b*, edge view of the tooth of *Cardiodon rugulosus: c*, edge view of a larger tooth of the same species; *d*, surface of the enamel, magnified.

PLATE 76.

Fig. 1.—Side view of the jaws of the *Ornithorhynchus paradoxus*, showing the position of *a* the incisive and *b* the molar horny teeth. *F. Cuvier. Fig.* 2. Left ramus of the lower jaw, showing the working or free surface of *a* the incisive, *b* the molar tooth. *F. Cuvier. Fig.* 3. A diminished view of a transverse slice of a small portion of the molar tooth of the Ornithorhynchus, showing the concentric walls of the canals of the principal tubes, and the minute pores or cells of the denser cementing fibrous substance. *Fig.* 4. View of the open mouth of a very young Fin-whale, (*Balænoptera*). *Brandt* and *Ratzeburg*. *a*. The outer vertical margins of the baleen plates; the letter is placed just above the horizontal line, or 'bead' of Hunter, which indicates the extent to which the cementing substance descends in the interspaces of the plates. *b*. The inner oblique bristled margins of the baleen-plates. *c*. The large tongue. *Fig.* 5. A vertical section of four baleen plates *in situ*. The transverse bar below the numeral represents the vascular gum from which the pulps proceed that penetrate the base of the plates. Below this is shown the elastic substance cementing the plates together; beyond which the plates project free, and terminate in the fringe of bristles at *c*. *Hunter. Fig.* 6. A diagram of the matrix of the baleen-plate. *a*. Dotted outline of the pulp, which forms *b*, the central fibrous part of the plate; *c*, the external layers of firm substance formed by the elastic cementing material. *Fig.* 7. A transverse slice of a portion of a baleen-plate, shewing the areæ of the tubular cavities of the coarse central fibres, and the outer denser substance. *Heusinger.** *Fig.* 8. Side view of the upper and lower molars of the *Orycteropus Capensis*. *F. Cuvier. Fig.* 9.

* *System der Histologie*, 4to. 1822.

Grinding surface of the lower molars of the same. *F. Cuvier*. *Fig.* 10. A longitudinal section of the lower molars of the same *in situ*: the section of the middle or antepenultimate molar has touched the lower end of the outer longitudinal groove, which might be mistaken for the remnant of a central pulp-cavity. *Original*. *Fig.* 11. Transverse section of a molar of the Orycterope. *F. Cuvier*.

PLATE 77.

A portion of a longitudinal slice of the base of a molar of the Orycteropus, magnified 150 linear diameters. *a*, *a*. The expanded apertures of the pulp-cavities of the component denticles. The dark parts of the continuation of the pulp-cavities indicate the dried remains of the vascular pulp there situated. *Original*.

PLATE 78.

A portion of a transverse section of a molar of the *Orycteropus*, magnified 500 linear diameters. *Original*.

PLATE 79.

A section of the tooth of the *Mylodon Darwinii* showing the dentinal cells, and a few vascular canals. *Original*.

PLATE 80.

Fig. 1. Transverse section of the five molars *in situ*, of one side of the upper jaw of the *Scelidotherium leptocephalum*. *Fig.* 2. A similar section of the four molars, lower jaw, of the same, $\frac{1}{4}$ths nat. size. *Fig.* 3. First upper molar. *Fig.* 4. Its grinding surface. *Fig.* 5. Transverse section of the four molars of one side of the lower jaw, *in situ*, of the *Mylodon Darwinii*: $\frac{2}{3}$ nat. size. *Fig.* 6. Transverse section of a molar of the *Megalonyx laqueatus*. (Perhaps another tooth of the *M. Jeffersonii*).

PLATE 81.

Fig. 1. Side view of the upper and lower jaws and teeth of the three-toed sloth, *Bradypus tridactylus*. *Fig.* 2. The same of the *Bradypus torquatus*. *Fig.* 3. The same of the two-toed sloth (*Cholœpus didactylus*). *Fig.* 4. Lower jaw, teeth removed from left ramus. *Fig.* 5. Separate teeth of the same sloth; *e*, canine; *b*, first; *c*, second; *d*, third; *e*, fourth upper molars. *De Blainville*.*

PLATE 82.

Fig. 1. Longitudinal section of the molar of *Bradypus tridactylus*, magn. 250 linear diameters. *Fig.* 2. A small portion of the same, magnified 500 linear diameters. *Original*.

PLATE 83.

A section of the upper jaw and five molar teeth of the *Megatherium Cuvieri*; *a*, cement; *b*, vaso-dentine; *c*, pulp-cavity; *d*, vacuity at the base which was occupied by the thick capsule, less than $\frac{1}{2}$ nat. size. *Original*.

PLATE 84.

Section of part of the molar of the *Megatherium*, including the hard dentine *c*; *a a'*, vaso-dentine; *b*, cement; b^1, loops of the vascular canals next the dentine. Magnified 500 linear diameters. *Original*.

PLATE 85.

Fig. 1.—Teeth of the great existing Armadillo (*Priodon gigas*); *a*, side view of upper molars; *b*, grinding surface; *c*, ditto of lower molars; *d*, side view of lower mo-

* Ostéographie des Animaux Vertèbres, 4to, 1839, et seq.

lars. *Fig.* 2. Upper and lower molars, right side, of the nine-banded Armadillo (*Tatusia Peba*). *Fig.* 3. Ditto of the Weasel-headed Armadillo (*Dasypus 6-cinctus*). *F. Cuvier*. *Fig.* 4. Longitudinal section of the tooth of *Dasypus 6-cinctus*). Magnified 300 linear diameters; *a*, osteo-dentine; *b*, *b*, hard dentine; *c*, cement. *Original.*

PLATE 86.

Fig. 1.—Portion of a molar tooth of the gigantic extinct Armadillo (*Glyptodon clavipes*). *Fig.* 2. Grinding surface of ditto. *Fig.* 3. Part of magnified section of ditto; *a*, osteo-dentine; *b*, *b*, hard dentine; *c*, cement. *Fig.* 4. Transverse section of upper molar of *Toxodon platensis*; $\frac{1}{2}$ nat. size. *Fig.* 5. Ditto of lower molar of *Toxodon*. (The enamel is erroneously drawn as extended over the whole concave folded side of the tooth). *Original.*

PLATE 87.

Fig. 1. Reduced view of base of skull, with the hidden rudimental tusk, and the base of the long tusk of the male Narwhal. (The mirror not having been used, this tusk is figured in the right, instead of the left intermaxillary). *Fig.* 2. Base of skull of female *Narwhal*, with both the rudimental tusks exposed. *Fig.* 3. Edentulous lower jaw of the Narwhal. *Fig.* 4. Section of large tusk of the male. *Home.*

PLATE 87 *a*.

Fig. 1. Rudimental teeth in the alveolar groove of the upper jaw of the fetal *Balænoptera Boops*. *Fig.* 2 to 6. Teeth from the same of the natural size. *Eschricht*. *Fig.* 7. Lower jaw and teeth of the Gangetic Dolphin (*Platanista gangetica*); *a* and *b*, detached teeth, nat. size. *Home.*

PLATE 88.

Fig. 1. End of the upper jaw of a young *Hyperoodon bidens*, shewing the two teeth. *Fig.* 2. Part of the lower jaw of a Dolphin (*Delphinus Delphis*); with the roots of the teeth exposed. *Original.*

PLATE 89.

Fig. 1. Reduced view of the lower jaw and teeth of a Cachalot or Sperm-whale (*Physeter macrocephalus*). *Fig.* 2. Section of a tooth of ditto, $\frac{1}{2}$ nat. size; *a*, cement; *b*, dentine; *c*, osteo-dentine. *Fig.* 3. One of the concealed teeth of the upper jaw; nat. size. 4. Fore part of its pointed end. *Original.*

PLATE 89 A.

Fig. 1.—Part of longitudinal section of the teeth of a Cachalot, magnified 230 linear diameters. *Fig.* 2. A peripheral portion of ditto, magnified 500 linear diameters; *a*, *b*, dentine; *c*, cement. *Original.*

PLATE 90.

Fig. 1.—Inside view of left ramus, lower jaw, of *Diprotodon australis*, $\frac{1}{4}$th nat. size; *i*, outline of incisive tusk; *m*, 1 to 5, molar teeth. *Fig.* 2. Outline of transverse section of crown of incisor, shewing partial covering of enamel. *Fig.* 3. Crown of penultimate molar; *m*, 4, nat. size. *Fig.* 4. Inside view of left ramus, lower jaw of *Nototherium inerme*, $\frac{1}{4}$th nat. size; *m*, 1 to 4; outlines of molar teeth. *Fig.* 5. Crown of penultimate molar of *Tapirus americanus*, nat. size. *Original.* *Fig.* 6. Upper and lower jaw of *Mastodon an-*

gustidens, $\frac{1}{8}$th nat. size. *i*, *i*. Outlines of lower and of base of upper incisive tusks; *m*, 6 and *m*, 7, penultimate and last molar teeth. *Kaup.*

PLATE 91.

Fig. 1.—Transverse section of crown of molar of *Zeuglodon cetoïdes*; *a*, isthmus connecting the two lobes. *Fig.* 2. Magnified view of portion of transverse section of the same; *a*, central osteo-dentine; *b b*, unvascular dentine, showing contour lines of basal substance; *c*, cement. *Fig.* 3. Small portion of outer part of previous section more highly magnified, showing *f*, indications of dentinal cells, secondary branches, and *e*, terminations of dentinal tubes; *d*, cellular and fine tubed cement. *Original.*

PLATE 92.

A section of the upper jaw of a young Dugong, (*Halicore indicus*) showing all the teeth that are developed in that jaw *in situ*; $\frac{1}{2}$ nat. size: *a*, deciduous incisor; *b*, permanent incisor, in longitudinal section; *c*, first molar; *d*, second molar *e*, third molar: these three molars are deciduous, but are not replaced by successors: *f*, fourth molar; *g*, fifth molar. These two molars are persistent and characterize the adult Dugong. *Original.*

PLATE 93.

Fig. 1.—Base view of upper jaw of *Dugong*, $\frac{1}{2}$ nat. size; *e*, remains of third or antepenultimate molar; *f*, penultimate molar; *g*, last molar. *Fig.* 2. Upper view of left ramus of lower jaw, $\frac{1}{2}$ nat. size; *a*, abortive incisor in one of the sockets of the deflected symphysis: *e*, antepenultimate molar; *f*, penultimate molar; *g*, last molar. Behind this is exposed a cavity in the substance of the jaw; not an alveolus. *Fig.* 3. Abortive incisor of the lower jaw, nat. size: *a*, contracted base, or pulp-cavity; *b*, crown wasted by the absorbent process. *Fig.* 4. Section of incisive tusk of male; $\frac{1}{2}$ nat. size. *Fig.* 5. Side view of antepenultimate molar, nat. size. *Fig.* 6. Crown of last upper molar, nat. size. The clear outer border shows the thickness of the cement. *Home.*

PLATE 94.

Reduced figure of a magnified view of a transverse section of the penultimate molar of a *Dugong*, showing the thick border of cement; the cells of the dentine near that border; the course of the dentinal tubes, and the central osteo-dentine. * Nat. size. *Original.*

PLATE 95.

Fig. 1.—Magnified view of a section of the incisive tusk; *c*, the cement, with radiated cells; *e*, the enamel, *d*, the dentine, showing the course and terminations of the tubes, and the peripheral outlines of the dentinal cells. *Fig.* 2. Magnified view of part of a transverse section of the same tusk: *a*, transverse sections of tein tercellular dentinal tubes; *b*, clear outlines of the dentinal cells. *Original.*

PLATE 96.

Fig. 1.—Side view of upper molars of Manatee (*Manatus americanus*): *a*, incisor, $\frac{2}{3}$ nat. size. *Fig.* 2. Grinding surface of upper molars. *Fig.* 3. Side view of a lower molar, nat. size. *Fig.* 4. Teeth of *Tapirus americanus*: the dotted lines divide the premolars from the true molars, $\frac{1}{3}$ nat. size. *Fig.* 5. Grinding surface of lower molars. *Fr. Cuvier.* *Fig.* 6.—Lower jaw and part of upper

jaw of *Dinotherium giganteum*, $\frac{1}{10}$ nat. size. *Fig.* 7. Grinding surface of lower molars. *Kaup.*

PLATE 97.

Fig. 1.—Fragment of upper jaw with three molars of *Halitherium Brocchii*, $\frac{1}{2}$ nat. size. *Fig.* 2. Part of lower jaw with three molars of *Halitherium Cuvieri*, $\frac{1}{2}$ nat. size. *Fig.* 3. Penultimate and last molars of *Halitherium Brocchii*, nat. size. *Fig.* 4. Penultimate lower molar, $\frac{2}{3}$ nat. size, of *Halitherium Cuvieri*. *Fig.* 5. Three lower molars, nat. size. of *Halitherium Cuvieri*. *De Blainville.*

PLATE 98.

Fig. 1.—Teeth of the Dog-headed Opossum (*Thylacinus Harrisii*) $\frac{1}{2}$ nat. size. *Fig.* 2. Teeth of the Ursine Opossum (*Dasyurus ursinus*). *Fig.* 3. Teeth of the Brush-tailed Opossum (*Phascogale penicillata*). *Fig.* 4. Teeth of the Banded Bandicoot (*Myrmecobius fasciatus*). *Fig.* 5. Skull and teeth of the Long-eared Bandicoot (*Perameles lagotis*). *Fig.* 6. Teeth of the Virginian Oppossum (*Didelphis virginiana*). In each of the above figures *p* is the premolars, *m*, the true molars. *Original.*

PLATE 99.

Fig. 1.—Right ramus of the lower jaw with all the teeth, save the canine, *l*, of the extinct *Amphitherium Prevostii* of the Stonesfield oolite: *i*, incisors; *p*, premolars; *m*, true molars. *Fig.* 2. A mutilated fossil jaw of the same species, showing the implantation of the teeth by two roots in distinct sockets. *Fig.* 3. Left ramus of the lower jaw of *Amphitherium Broderipii*, with the missing teeth restored in outline. (The original is in the Museum at York.) *Fig.* 4. Inner side of right ramus of lower jaw of the *Phascolotherium Bucklandi*: *i*, incisors; *l*, canine; *p*, premolars; *m*, molars. The natural size of each specimen is given in outline. *Original.*

PLATE 100.

Fig. 1.—Teeth of the *Phalangista vulpina*. *Fig.* 2. Teeth of the *Phalangista Cookii*. *Fig.* 3. Skull and teeth twice nat. size of the *Phalangista gliriformis*. *Fig.* 4. Teeth of the *Petaurus flaviventer*. *Fig.* 5. Lower jaw of the *Petaurus pigmæus*. *Fig.* 6. Teeth of the Koala (*Phascolarctus fuscus*). *Fig.* 7. Teeth of a Potoroo (*Hypsyprymnus*). *Fig.* 8. Teeth of a Kangaroo (*Macropus*). *Fig.* 9. Teeth of a Wombat (*Phascolomys Vombatus*).

PLATE 101.

Fig. 1.—Portion of lower jaw of a great extinct Kangaroo (*Macropus Titan*) showing the second true molar, and the germ of the premolar in the closed alveolus. *Fig.* 2. Grinding surface of the second premolar of *Macr. Titan*. *Fig.* 3. Portion of lower jaw of another species of great Kangaroo (*Macropus atlas*), showing the incisor, the first deciduous molar in outline, the second deciduous molar, the four true molars, and the germ of the premolar in the closed alveolus. *Fig.* 4. Grinding surface of the second molar of the *Macr. atlas*. *Fig.* 5. Inner side of the crown of the lower incisor of the *Macr. atlas*.

PLATE 102.

Fig. 1.—One half of a transverse section of the lower incisor of a Kangaroo (*Macropus major*), showing the course of the dentinal tubes at *d*, and the fine fibres of the thick enamel at *e*. *Fig.* 2. A single

dentinal tube magnified 400 linear times, showing two dichotomous subdivisions, a few primary branches, the secondary minute lateral branches, and the terminal cellules at the boundary line next the enamel.

PLATE 103.

Fig. 1.—A portion of a section from the extremity of a worn upper tusk of the *Mastodon giganteus*, magnified 350 diameters, showing at *d*, the dentinal tubes and cells, and at *c*, the thick cement; *c'*, a group of the radiated granular cells of the cement. *Fig.* 2. A portion of a section of a molar of the Wombat (*Phascolomys Vombatus*), magnified 350 diameters, showing *d d*, the terminations of the dentinal tubes; *e*, the enamel; and *c*, *c*, the coronal cement. *Original.*

PLATE 104.

Fig. 1.—Right ramus of the lower jaw of a Porcupine (*Hystrix cristatus*), showing, *i*, the crown, and *i'* the exposed pulp, receiving its recurrent nerve, of the scalpriform incisor: *p*, the premolar; *m*, the three true molars. *Fig.* 2. The upper jaw of the Patagonian Cavy (*Dolichotis patachonica*): *i*, incisor; *p*, premolar; *m*, molars. *Fig.* 3. Teeth of lower jaw of the Patagonian Cavy: *i*, the incisor; *p*, the premolar; *m*, the true molars. *Fig.* 4. Upper molars of the Guinea-pig (*Cavia porcellus*): *d*, *p*, deciduous molar; *p*, permanent premolar; *m*, molars. *Fig.* 5. Upper teeth of the Rabbit (*Lepus cuniculus*): *i*, permanent incisor; *d i* 2, deciduous second incisor; *i* 2, permanent second incisor; *p d*, deciduous molars; *p*, premolars; *m*, true molars.

PLATE 105.

Grinding surface of molar teeth of various genera of Rodents. *Fig.* 1. Molar series, right side, upper jaw, magnified, of the Squirrel (*Sciurus vulgaris*). *F. Cuvier.* *Fig.* 2. Right series, upper jaw, magnified, of the Flying Squirrel (*Pteromys taguanoïdes*). *F. Cuvier.* *Fig.* 3. Right series, upper jaw, magnified, of the Souslik, or Pouched-Marmot (*Spermophilus citillus*); *a*, young; *b*, old molars. *Cuvier, Oss. Foss.* *Fig.* 4. Right series, upper jaw, magnified, of common Marmot (*Arctomys alpinus*). *Cuvier, Oss. Foss.* *Fig.* 5. Right series, upper jaw, nat. size, of the Beaver (*Castor fiber*). *Cuvier, Oss. Foss.* *Fig.* 6. Right series, lower jaw, magnified, in two stages of attrition of the Dormouse (*Myoxus avellanus*). *F. Cuvier.* *Fig.* 7. Molar series: *a*, upper; *b*, lower jaw, magnified, of the Jerboa (*Dipus sagitta*). *F. Cuvier.* *Fig.* 8. Left series, upper jaw, magnified, of the Gerbille (*Meriones indicus*). *Cuvier, Oss. Foss.* *Fig.* 9. Right series, upper jaw, magnified, unworn, of the Rat (*Mus decumanus*). *Cuvier, Oss. Foss.* *Fig.* 10. Right series, upper jaw, magnified, in two stages of abrasion, of the Rat (*Mus decumanus*). *F. Cuvier.* *Fig.* 11. Right series, upper jaw, in two stages of abrasion, of the Cape-Mole (*Orycteromys capensis*). *Cuvier, Oss. Foss.* *Fig.* 12. Right series, upper jaw, magnified, of the Field-Vole (*Arvicola amphibia*). *Cuvier, Oss. Foss.* *Fig.* 13. Right series, upper jaw, of the Porcupine (*Hystrix cristatus*). *Cuvier, Oss. Foss.* *Fig.* 14. Right series, upper jaw, magnified, of the Agouti (*Dasyprocta Agouti*). *Cuvier. Oss. Foss.* *Fig.* 15. Right series, upper jaw, of the Cavy (*Cœlogenys fusca*). *Cuvier, Oss. Foss.* *Fig.* 16. Right series, upper jaw, magnified, of the Guinea-Pig (*Cavia porcellus*). *Cuv. Oss. Foss.* *Fig.* 17. Right

series, upper jaw, of the Capybara (*Hydrochærus Capibara*). *Cuvier, Oss. Foss.* *Fig.* 18. Right ramus of the lower jaw, with the incisor and the two molars, magnified, of the Australian Water-rat (*Hydromys flaviventer*). *F. Cuvier.*

PLATE 106.

View of a section of the incisor of a Beaver (*Castor fiber*), under a magnifying power of 250 linear dimensions, reduced to one third the size as so viewed: *d d*, the dentine forming the convex side of the incisor; *d'*, the dentine forming the concave side; *v v*, vascular canals of the central tract of vaso-dentine; *e*, inner layer of enamel; *e'*, outer and denser layer of enamel; *c*, thin outer layer of coloured cement. *Original.*

PLATE 107.

The magnified sections of teeth in this, and the two following plates, are figured as seen on a dark ground, by reflected light. *Fig.* 1. Transverse section of a molar of a Squirrel (*Sciurus vulgaris*). *Fig.* 2. Ditto of a Beaver (*Castor fiber*): *d*, dentine; *e*, enamel; *c*, cement. *Erdl.**

PLATE 108.

Fig. 1.—Transverse section of the molar of a Rat (*Mus decumanus*). *Fig.* 2. Vertical section of the molar of a Flying Squirrel (*Pteromys volucella*): *d*, dentine; *e*, enamel; *c*, cement. *Fig.* 3. Transverse section of the molar of a Water-Vole (*Arvicola amphibia*): *d*, dentine; *e*, enamel; *c*, cement; *o*, osteo-dentine. *Erdl.*

PLATE 109.

Fig. 1.—Transverse section of the molar of a Hare: *d*, dentine; *e*, enamel. *Fig.* 2. A small portion of the dentine of a Beaver's tooth, magnified more highly to show the secondary undulations of the dentinal tubes. *Fig.* 3. A small portion of the dentine of a Calf's molar more highly magnified, showing the terminal loops and branches of the dentinal tubes. *Fig.* 4. A small portion of the cement of the same tooth similarly magnified, showing the cemental tubes and cells. *Erdl.*

PLATE 110.

Fig. 1.—Teeth of the Cape-Mole (*Chrysochloris aurea*). *Fig.* 2. Teeth of the Virginian Shrew-Mole (*Scalops aquaticus*). *Fig.* 3. Teeth detached, and jaws showing the sockets, of the Common-Mole (*Talpa europæa*): *i*, incisors; *c*, canines; *p*, premolars; *m*, molars. *Fig.* 4. Teeth detached, and jaws showing the sockets of a Shrew (*Sorex tetragonurus. Duvernoy.*). *Fig.* 5. Teeth detached, and jaws showing the sockets of the Hedgehog (*Erinaceus europæus*). *Fig.* 6. Teeth detached, and jaws showing the sockets of the Tenrec (*Centetes ecaudatus*). From *De Blainville.*

PLATE 111.

Fig. 1.—Teeth and different views of the incisors of the *Solenodon paradoxus. Brandt*: *a*, front view of upper incisors; *a'*, back view of an upper incisor; *b*, front view of lower incisors; *c*, inside view of one lower incisor, showing the deep groove. *Fig.* 2. Base of cranium, magnified, of the common Shrew (*Sorex araneus*), showing the crowns of *i*, the single incisor; *p*, the premolars; *m*, the true molars. *Fig.* 3. Upper jaw showing the crowns of the teeth of the Tupaia (*Glisorex tana*). *Fig.* 4. Upper jaw

* Abhandlungen der K. Bayerischen Akademie: Bd. iii. 1841.

showing the crowns of the teeth of the *Gymnura Rafflesii: 4a*, cranium and side view of the teeth; *4b*, lower jaw and side view of the teeth of the same Insectivore. *Fig.* 5. Upper jaw, showing the crowns of the teeth of the Hedge-hog (*Erinaceus europæus*). *Fig.* 6. Upper jaw, showing the crowns of the teeth of the Cape-Hedgehog (*Ericulus spinosus*). *De Blainville.*

PLATE 112.

Fig. 1.—Outline of skull, and left upper teeth of the Common Bat (*Vespertilio murinus*). *Fig.* 1'. Outline of lower jaw, and left lower teeth of the Common-Bat. *Fig.* 1''. Outline of skull and lower jaw of a very young Bat, with the deciduous teeth: *i i*, upper and lower permanent incisors; *i̇ i̇*, upper and lower deciduous incisors; *c c*, upper and lower permanent canines; *c'*, upper and lower deciduous canines; *p p*, upper and lower permanent premolars; *p' p'*, upper and lower deciduous molars; *m m*, permanent true molars. *Fig.* 2 2'. Upper and lower teeth of the Noctule (*Vespertilio noctula*). *Fig.* 2''. Front view of upper incisors and canines of ditto. *Fig.* 3. Upper and lower teeth of the Serotine (*Vespertilio serotinus*). *Fig.* 4. Upper and lower teeth of the *Glossophaga*. *Fig.* 5. Upper and lower teeth of the Horse-shoe Bat (*Rhinolophus ferrum-equinum*). *Fig.* 6 and 6'. Upper and lower teeth of *Nycteris*. *Fig.* 6''. Front view of the incisors and canines of ditto. *Fig.* 7. Side view of the teeth of ditto. *Fig.* 8. Side view of the teeth of *Phyllostoma hastatum*. *Fig.* 9. Side view of the teeth of the Vampire-Bat (*Desmodus spectrum*). *Fig.* 10. Upper and lower teeth of a Frugivorous Bat (*Pteropus*). *Fig.* 10''. The same teeth detached. *Rousseau* and *De Blainville.*

PLATE 113.

Fig. 1.—A reduced figure of a magnified view of a longitudinal section of the molar tooth of *Pteropus edulis: d' d'*, dentinal cells.* nat. size. *Fig.* 2'. A small portion of dentine and enamel, magnified 400 linear diameters, showing *d*, the dichotomous branches of the dentinal tubes; *e*, the enamel. *Original.*

PLATE 113*a*.

Fig. 1.—A reduced figure of a magnified view of a transverse section of the canine tooth of the *Pteropus edulis: d*, the dentinal cells. *Fig.* 2. A small portion of the peripheral part of the dentine of the same tooth, showing the dichotomous divisions and small lateral branches of the dentinal tubes, and the peripheral contour of *d' d'*, the dentinal cells. *Original.*

PLATE 114.

Fig. 1.—Upper teeth of the Common Colugo (*Galeopithecus Temminckii*). *Fig.* 1*a*. Lower teeth of the same. *Fig.* 1*b*. Upper and lower deciduous and permanent teeth of the same; in each figure *i*, is incisors; *c*, canine; *p*, premolars; *m*, molars. *Fig.* 2. Teeth of the *Cheiromys Madagascariensis*. *Fig.* 3. Teeth of the Malmag (*Tarsius spectrum*). *Fig.* 4. Teeth of the Slow-Lemur (*Stenops tardigradus*). *Fig.* 5. Teeth detached of the Maki-Lemur (*Lemur macauco*). *Fig.* 6. Teeth of the Woolly Indri (*Lichanotus laniger*). *Fig.* 7. Teeth of the Galago (*Otolicnus madagascariensis*). *Fig.* 8. Teeth of the Marmoset (*Hapale jacchus*), magnified. *Fig.* 9.

Teeth detached of a Capuchin Monkey (*Cebus capucinus*). *Fig.* 10. Teeth of one side of the upper jaw of a Howler-Monkey (*Mycetes*): *i*, incisors; *c*, canines; *p*, premolars; *m*, molars. *De Blainville.*

PLATE 115.

A longitudinal section of a lower incisor of a *Galeopitheus*, magnified, *m*, medullary canal, or continuation of the pulp-cavity into a division of the crown, 1. entire incisor, nat. size; *i*, *g*, the same slightly magnified. *Original.*

PLATE 116.

Fig. 1.—The upper and lower series of teeth of the left side detached of the *Cercopithecus Sabæus*. *Fig.* 2. The teeth of the left side of the lower jaw *in situ*, of the *Macacus radiatus*. *Fig.* 3. *m* 1, the first, and *m* 3 the last true molar, left side of the lower jaw of the fossil Monkey of the Eocene tertiary sand in Suffolk, (*Macacus eocœnus*). *Fig.* 4. Incisors, canine and first premolar of left side upper jaw, of the Mandrill, (*Cynocephalus maimon*). *Fig.* 4'. *i*, incisors; *c*, canine; *p*, first premolar, of left side, lower jaw of the Mandrill (*Cynocephalus Maimon.*) *Fig.* 5. Teeth of left side of upper and lower jaw of a *Semnopithecus*. *Fig.* 6. The same of a Gibbon (*Hylobates.*) *Fig.* 7. Front view of the crown of the grooved canine of a Spider Monkey (*Ateles*). *Fig.* 8. Front view of the grooved canine of a Baboon (*Cynocephalus*). *De Blainville, (figs. 2 & 3, original.)*

PLATE 117.

Fig. 1.—Side view of the teeth, left side, upper and lower jaw of the male Great Orang-Utan (*Simia Wurmbii*). *Fig.* 2. Grinding surface of the upper teeth, left side of the same. *Fig.* 3. Side view of the upper teeth, left side, of the female *Simia Wurmbii*. *Fig.* 4. Side view of the upper and lower teeth, left side, of the male Kasser Orang, (*Simia Morio.*) Each figure is of the nat. size; *i*, incisors; *c*, canines; *p*, premolars; *m*, molars. *Original.*

PLATE 118.

Fig. 1. A side view with the fangs exposed, and a view of the grinding surface, of the teeth of the left side, upper jaw, of the male Chimpanzee (*Simia Troglodytes*). *Fig.* 2. Aboriginal Australian. *Fig.* 3. Europæan. *Original.*

PLATE 119.

A view of the grinding surface, and a side view with the roots exposed, of the teeth of the left side, lower jaw, of, *Fig.* 1. male Chimpanzee. *Fig.* 2. Australian. *Fig.* 3. Europæan. *Original.*

PLATE 119. A.

Fig. 1. A portion of a longitudinal section of the crown of an incisor of the Chimpanzee, magnified 450 linear diameters; *e*, enamel fibres; *t*, dentinal tubes; *d*, dentinal cells. *Fig.* 2. A portion of a transverse section of the incisor of a Chimpanzee, near the centre of the crown; *a*, areæ of dentinal tubes; *b*, proper walls of the tube; *i*, intertubular substance, magnified 800 linear diameters. *Original.*

PLATE 120.

Fig. 1.—Part of the skull of a young Chimpanzee, showing the deciduous and some of the permanent teeth of the left side. *Fig.* 2. Jaws of the left side of an Orang-Utan, giving a similar view of the

deciduous and permanent teeth, nat. size. In both figures, *i* 1, is crown of first upper permanent incisor; *i* 2, second permanent incisor; *c*, permanent canine; *p* 1, first premolar; *p* 2, second premolar; *m* 1, first permanent true molar; *m* 2, second permanent true molar. The germs of the permanent teeth are not exposed in the lower jaw. *Fig.* 3. Grinding surface of first and second upper true molars, in different states of abrasion of a New Zealander. *Fig.* 4. The corresponding molars of the lower jaw. *Original.*

PLATE 121.

Fig. 1. Side view. *Fig.* 2. Front view of the deciduous and permanent teeth in the jaws of a child of six years and a half: nat size. *i* 1, first permanent incisor; *i* 2, second incisor; *c*, canine; *p* 1, first premolar or bicuspid; *p* 2, second premolar; *m* 1, first true molar; *m* 2, second true molar. *Original.*

PLATE 122.

Structure of the Human Teeth. *Fig.* 1. A longitudinal section, from side to side of a middle lower incisor. 1 *a*. a transverse section across the line traversing *fig.* 1. *Fig.* 2. A longitudinal section, from before backwards, of a middle lower incisor. 2 *a*, a transverse section across the line traversing fig. 2. 2 *b*, a transverse section across the line. *Purkinje and Fraenkel.* *Fig.* 3. A longitudinal section, from before backwards, of a lower canine. 3 *a*, a transverse section, across the line traversing *fig.* 3. *Retzius.* *Fig.* 4. A longitudinal section of a lower premolar, or bicuspis. 4 *a*, a transverse section through the fang. *Purkinje.* *Fig.* 5. A transverse section of the dentine of a bicuspis with undivided pulp-cavity, *Retzius.* *Fig.* 6. A longitudinal section of a lower molar, nat. size, showing the general course of the dentinal tubes. *Leeuwenhoek.* *Fig.* 7. A longitudinal section of a molar. *Fig.* 8. A transverse section of the root of the canine of an aged person, showing hyperthropy of the cement, *Retzius.* *Fig.* 9. A longitudinal section of a lower incisor, which, with *fig.* 6, gives the scale on which the other figures are magnified. The following letters indicate the same parts in each of the above figures; *c*, cement; *d*, dentine; *e*, enamel; *e'* dusky longitudinal striæ of enamel; *l*, contour lines of dentine; *o*, osteodentine; *v*, vascular or pulp-cavity.

PLATE 122. A.

Fig. 1.—Portion of a transverse section of the crown of a Human tooth, showing at *d*, the divided extremities of the dentinal tubes; and at *e* the wavy transverse fibres of the enamel and the flexuous fissures near the dentine. *Fig.* 2. A section taken, almost parallel with the outer surface of the enamel, near its dentinal surface, showing the arrangement of the fibres of the enamel according to the length of the tooth, and the rhomboidal figure of the obliquely cut ends of the enamel-fibres. *Purkinje and Fraenkel.* *Fig.* 3. Part of a section almost vertical to the outer surface of the enamel and parallel with its fibres, showing their transverse markings (*Retzius*): magnified 350 linear dimensions. *Fig.* 4. A small part of a transverse section of dentine, magnified to the same degree; *a*, area of dentinal tube; *b*, parietes of ditto; *i*, intertubular space. *Fig.* 5. Portions of five dentinal tubes

showing the secondary undulations, the walls, and the disgregated arrangement of their calcareous contents, which give them the appearance of beaded fibres. *Retzius.* *Fig.* 7. Transverse section of the matrix of a canine tooth of the fœtus of a Dog; viewed by reflected light on a dark ground; *c*, capsule; *i*, space filled by the fluid blastema of enamel-pulp; *e*, actinenchyma and internal stratum of cylindrical cells of enamel-pulp; *i*, interspace between enamel and dentinal pulp; *p*, external or preformative membrane of dentinal pulp; *d*, dentinal pulp; *Purkinje.* *Fig.* 7. Matrix of the tooth of a fœtal calf at the nineteenth week; *v*, vascular basis of dentiparous grove from which is developed *d* the dental papilla or pulp; it is covered, as with a cap, by *e* the semifluid enamel-pulp; and this is developed from the inner surface of *c* the capsule; to the summit of which adheres, *g*, a portion of the gum, characterized by the epithelial cells, which M. Serres has described as the glands which secrete the tartar of the teeth. *Fig.* 8. Matrix of an incisor of a nearly mature fœtal dog; *c*, capsule; *d*, dentinal pulp with its summit calcified and forming a cap of dentine; *e*, enamel-pulp; *i*, fluid part of enamel-pulp, next the capsule. *Fig.* 9. Part of a transverse section of the coronal end of the matrix of a molar of a fœtal Calf; *c*, capsule; *e*, actinenchymatous part of enamel-pulp; e^1, elongated cylindrical cells of enamel-pulp; next the dentine; *d*, dentinal pulp; d^1, calcified portions of the same. *Purkinje and Rashkow.*

PLATE 123.

Fig. 1.—Part of a longitudinal section of a Human Incisor, magnified 230 linear dimensions, as seen by transmitted light. *t*, Dentinal tubes; *d.*, dentinal cells; $d^{\cdot\cdot}$, terminal opake cellules close to the pitted surface of the dentine for the attachment of *e e*, the enamel. *Fig.* 2. Portions of fibres of newly-formed enamel, with intermediate cell-membrane; and the marks *e e*, on the membrane covering the calcified parts of the cells. *Original.*

PLATE 124.

A longitudinal section of an imperfect bicuspis, developed, with hair, in a cyst of the human ovarium. *Nat. size; *d*, dentine; *e*, enamel; *o*, osteo-dentine; *v*, pulp-cavity; *c*, cement, passing into *b*, bone, uniting the fang with *d* part of the dentine of another tooth. *Original.*

PLATE 125.

Fig. 1.—Upper and lower incisors and outlines of canines, ½ nat. size, Wolf (*Canis Lupus*). *Fig.* 2. Upper and lower canines and molars, ½ nat. size, Wolf. *Fig.* 3. Crowns of three last teeth, or true molars, lower jaw, ½ nat. size, Wolf. *Fig.* 4. Deciduous and permanent series of teeth, young Dog, from the inside, nat. size. *Fig.* 5. Crowns of teeth of left side of upper jaw of the long-eared Fox (*Megalotis*). *Fig.* 6. Upper and lower teeth, left side, of the *Proteles Lalandii*, *d* 2 and *d* 3, deciduous molars. *De Blainville* and *Rousseau.*

In this and all the succeeding plates, the following letters and numerals signify the same teeth.

i, incisor, 1 the first or mid-incisor, 2 the second, 3 the third or outer incisor. In some Plates the deciduous incisors are marked *d i*. *c*, canine. *p*, premolars, 1, first or foremost, 2 second, 3 third,

4 fourth or hindmost. *m*, molars, 1 first or foremost, 2 second, 3 third or hindmost. *d*. deciduous molars, 1 first or foremost, 2 second, 3 third, 4 fourth. The typical number of teeth in the placental *Carnivora* and *Ungulata* is :—

$$\dot{i}.\frac{3-3}{3-3};\ c.\frac{1-1}{1-1}\ p.\frac{4-4}{4-4}\ m.\frac{3-3}{3-3}: = 44.$$

The teeth that are wanting in the formulæ which fall short of this number may be known, in the figures, by the letters and numerals of those that are present.

PLATE 126.

Fig. 1.—Teeth of the Indian Civet (*Viverra indica*). *Figs.* 2 & 3. Crowns of last premolar and of the true molars of left upper and lower jaws. *Fig.* 4. Left series above and below of Bennett's Water-civet (*Cynogale Bennettii*), showing the interlocking of the crowns of the teeth, when the jaws are closed. *Fig.* 5. Crowns of last premolar and two true molars of *Cynogale Bennettii*. *Fig.* 6. Teeth of the striped Hyæna (*Hyæna vulgaris*), ($\frac{1}{2}$ nat. size). *Fig.* 7. Crowns of last two premolars and of the single molar, upper jaw. *Fig.* 8. Crowns of last premolar and last true molar, lower jaw. *De Blainville*. *Fig.* 9. Left ramus of fossil lower jaw of a young Cave Hyæna (*Hyæna spelæa*) showing the three deciduous molars, 1, 2, 3; and the crowns of some of the permanent teeth. *Original.*

PLATE 127.

Fig. 1.—Teeth of a Leopard (*Felis Leopardus*), $\frac{1}{2}$ nat. size. *Fig.* 2. Crown of last premolar (sectorial) and of the single molar, upper jaw, of a Tiger, nat size. *Fig.* 3. Crown of single true molar (sectorial) lower jaw. *Fig.* 4. Left upper and lower jaw of a young Lion (*Felis Leo*) with the deciduous teeth, and the germs of the permanent ones displayed from the inner side. *Rousseau*. *Fig.* 5. Outline of skull and lower jaw of *Machairodus megantereon*, with the teeth ($\frac{1}{3}$ nat. size). *De Blainville*, after *Bravard*. *Fig.* 6. Back or cutting and serrate edge of the crown of the upper canine of *Machairodus latidens*. *Original.*

PLATE 128.

Fig. 1.—Premolars and molars, left side of both jaws of the Taira (*Galictis barbara*). *Fig.* 2. Crowns of last premolar and single molar, upper jaw of *Galictis barbara*. *Fig.* 3. Crowns of the two true molars, lower jaw of *Galictis barbara*. *Fig.* 4. Premolars and true molars, left side of both jaws of the Otter (*Lutra vulgaris*). *Fig.* 5. Crowns of last premolar and of single true molar, upper jaw of the Otter. *Fig.* 6. Crowns of the two true molars, lower jaw of the Otter, (the second is marked *m* 1, it should be *m* 2). *Fig.* 7. Dental series, left side of both jaws of the Glutton, (*Gulo luscus*). *Fig.* 8. Crowns of last premolar (sectorial) and of the single true molar. *Fig.* 9. Crowns of first true molar (sectorial) and second true molar (tubercular). *Fig.* 10. Crowns of premolars and single true molar, left side, lower jaw, of the Ratel (*Mellivora capensis*). *Fig.* 11. Crowns of the teeth of the left side, upper jaw, of a Skunk (*Mephitis Humboldtii*). *Fig.* 13. Crowns of the teeth of the left side of both jaws of the Indian Badger (*Arctonyx*). *De Blainville*. *Fig.* 12. Crowns of the teeth of the left side of both jaws of the Sea Otter (*Enhydra marina*). *Original.*

PLATE 129.

Figs. 1 & 4.—Crowns of the teeth of the right side of both jaws of the common Badger (*Meles taxus*). *Fig.* 2. Right upper canine tooth. *Fig.* 3. Right upper true molar. *Fig.* 5. Right lower canine. *Fig.* 6. Right lower true molars. *Fig.* 7. Dental series, right side, upper jaw of the Raccoon (*Procyon lotor*). *Figs.* 8 & 11. Crowns of the teeth of the right side of both upper and lower jaws of the Brown Coati (*Nasua fusca*). *Fig.* 9. Right upper canine. *Fig.* 10. Right upper true molars. *Fig.* 12. Right lower canine. *Fig.* 13. Right lower true molars, *Nasua fusca*. *Figs.* 14 & 15. Crowns of the teeth of the right side of upper and lower jaw of the Benturong, (*Arctictis aurea*. *Figs.* 16 & 17. The same of the Kinkajou (*Cercoleptes caudivolvulus*). *De Blainville.*

PLATE 130.

Fig. 1.—Right upper jaw of a young Bear, showing the deciduous and some of the permanent teeth. 2, 3 & 4 indicate the germs of the second, third and fourth premolars. *Fig.* 2. Part of right lower jaw, showing the deciduous teeth and some of the permanent teeth. *Fig.* 3. Teeth of right side, upper jaw of Brown Bear, (*Ursus arctos*). *Fig.* 4. Crowns of the same, ½ nat. size. The figures 2 & 3 indicate the places whence the second and third small premolars have been shed. *Fig.* 5. Crowns of the teeth, right side, lower jaw. *Fig.* 6. The same teeth detached of the *Ursus arctos*. *De Blainville.*

PLATE 131.

Different views of the teeth, ½ nat. size, of the fossil Bear from the Sewalik tertiary deposits (*Hyænarctos Sivalensis*, Cautley and Falconer). *Original.*

PLATE 132.

Fig. 1.—Teeth of left upper and lower jaws of the Common Seal (*Phoca vitulina*). *Fig.* 2. Canines and molars of the left upper and lower jaws of the Bearded Seal (*Phoca barbata*). *Fig.* 3. Crowns of right upper molars of the Hooded Seal (*Pelagius monachus*). *Original. Fig* 4. Molars of left upper and lower jaw of the Saw-toothed Seal (*Stenorhynchus serridens*). *Original. Fig.* 5. Canines and molars of the left upper and lower jaws of the Grey Seal (*Halichærus gryphus*). *Fig.* 6. Crowns of the teeth of the upper jaw of the Sea-Lion (*Otaria jubata*). *De Blainville. Fig.* 7. Teeth of left upper and lower jaws of the Sea-Elephant, ½ nat. size, (*Cystophora proboscidia*). *De Blainville. Fig* 8. Teeth of the right upper jaw of the Walrus, ¼ nat. size. *i.* molariform incisor; *c*, long canine tusk; *m* 4, rudiment of fourth molar. *Original.*

PLATE 133.

Fig. 1.—Teeth of left side of both jaws of the Musk-Deer (*Moschus moschiferus*). *c*, the large upper canine tusk; c^1, the small lower canine. Three true molars succeed p. 1, 2, 3, the three premolars*, in both jaws. *Fig.* 2. Teeth of the left side of both jaws, fangs not exposed, of the Vicugna (*Auchenia Vicugna*), *i*, upper incisor; *c*, upper canine; i^1, lower incisors; c^1, lower canine. *Fig.* 3. Crown of last molar, left side, lower jaw of the Sivatherium; *c*, cement in the crescentic fold of anterior lobe; *e*, the dentine; *d*, the enamel. *Fig.* 4. Permanent and

* These correspond with *p* 2, 3 & 4, in figs. 2 & 3, Pl. 135, Anoplothere.

deciduous teeth, left side, lower jaw of a Sheep of twenty months. *i* 1, First permanent incisor; *i* 2, crown of second permanent incisor; *d* 2 and *d* 3, second and third deciduous incisors; *d*, *c*, deciduous canine; *d* 1, 2 & 3, the three deciduous molars; p. 1, 2, 3, the crowns of the three premolars,* which displace them; *m*. 1, 2, 3, the three true molars. *Original.*

PLATE 134.

Grinding surface of second true molar. *Fig.* 1. Sheep. *Fig.* 2. Upper, 2^1 lower, Gnu. *Fig.* 3. Upper, 3^1 lower, Ox. *Fig.* 4. Upper and lower, Aurochs. *Fig.* 5. Upper and lower, Megaceros. *Fig.* 6. Upper and lower, Elk. *Fig.* 7. Upper and lower, Giraffe. *Fig.* 8. Upper and lower, Camel. The same letters indicate the same parts in each of the foregoing figures, which are of the natural size; *o*, outer surface; *i*, inner surface; *o d*, outer crescentic lobule of dentine; *i d*, inner ditto; *e*, central crescentic enamel island or fold; *p*, small column at the inner interspace of the lobes of the upper molars, and at the outer interspace of those of the lower molars, of certain Ruminants. *Fig.* 9. *i*, Lower incisor, and *c*, canines; of the Gnu. *Fig.* 10. The same of the Dromedary. *Original.*

PLATE 135.

Fig. 1. Reduced outline of jaws and teeth of *Anoplotherium commune*. *Fig.* 2. Grinding surface of molar series, upper jaw. *Fig.* 3. The same of the lower jaw: *Anoplotherium*: $\frac{2}{3}$ nat. size. *Fig.* 4. Reduced outline of jaws and teeth of *Palæotherium magnum*. *Fig.* 5. Grinding surface of molar series, upper jaw. *Fig.* 6. The same of the lower jaw; (*Palæotherium crassum*); $\frac{1}{2}$ nat. size. *Cuvier*. *Fig.* 7. The molars of the lower jaw of the *Macrauchenia patachonica*: $\frac{1}{4}$ nat. size. *Fig.* 8. Crown of last lower molar, *Lophiodon*: $\frac{1}{2}$ nat. size. *Fig.* 9. Crown of last lower molar, *Coryphodon*: $\frac{1}{3}$ nat. size. *Fig.* 10. Crown of last lower molar, *Anthracotherium*: $\frac{1}{2}$ nat. size. *Original.* The letters and numerals for individual teeth signify the same as those explained after Pl. 125. The letters for parts of the teeth signify; *o*, the outer; *i*, the inner surface; *b*, the valley entering from the inner surface; *e*, its anterior and external termination, sometimes insulated, as at p. 4, *fig.* 5; *c*, the valley entering from the hinder surface; *o d*, the outer crescentic lobule of dentine; *i d*, the inner lobule; *p*, the column at the entry of the valley *b*.

PLATE 136.

Fig. 1. Grinding surface of the upper molar series, right side, $\frac{1}{2}$ nat. size, of a Horse, (*Equus caballus*). *Fig.* 2. Grinding surface of the lower molars, left side, of a Horse. $\frac{1}{2}$ nat. size; *b*, oblique valley entering the crown from the inner side; *e*, its termination, insulated; *c*, posterior valley insulated; *p*, internal column, confluent with the anterior lobe of dentine. *Fig.* 3. Grinding surface of upper molar of the Hippotherium; *p*, the column, insulated; *o*, *o*, the outer sides; *i*, *i*, the inner sides. *Fig.* 4. Dentition of a Foal six months old, $\frac{2}{3}$ nat. size; showing the deciduous incisors, *d*, 1, 2, 3; the deciduous canines, *d*, *c*, and first deciduous molars, *d*, *m*; and the rudimental premolar, *p*. 1. The other deciduous molars are omitted. *Bojanus*. *Fig.* 5. The deciduous and permanent molars from the outer side,

* These correspond with p. 2, 3 & 4, in the *Anoplothere*.

upper jaw, ½ nat. size, of a Colt of two years. *Fig.* 6. The dentition of a Colt of three years, from the inner side of the upper jaw, ½ nat. size. *Rousseau.* *Fig.* 7. The incisors and canine of the left side of the lower jaw of a Colt of four years, ½ nat. size. The third permanent incisor, *i* 3, has not yet displaced its deciduous predecessor, *d*, *i* 3. *Rousseau.* *Fig.* 8. The incisors of the right side of the upper jaw of a Horse of five years, shewing the mark *a*, long and deep in all, and irregular on the inside in the outer incisor, *i* 3. *Fig.* 9. The upper incisors and canine of the right side of a Horse of six years, shewing the mark faint in the first and second incisors; but the inflected margins and point of the canines, *c*, are still sharp. *Fig.* 10. The upper incisors and canine of the right side of an aged Horse, about sixteen years. The cavity of the mark is obliterated; the dark coloured osteo-dentine, and some remains of cement in the outer incisor, indicate their place; the margins and point of the canine are rounded off. *Fig.* 11. Longitudinal section of an incisor showing the depth of the vertical fold of enamel *a*, and the cement at its bottom a^1; *e*, is the outer enamel and *c*, the outer cement. *Rousseau.*

PLATE 137.

A section of part of the crown of a molar of a Horse, showing *a* dentine; *b*, enamel; *c*, cement, in which are many vascular canals, *v v*. Magnified 150 linear diameters. *Original.*

PLATE 138.

Fig. 1. Reduced view of the skull of the extinct hornless Rhinoceros, (*Acerotherium incisivum*), *Kaup.* *Fig.* 2. Reduced view of the skull of the two horned Rhinoceros (*Rhinoceros bicornis*). *Cuvier.* *Fig.* 3. Grinding surface of molar series, right side upper jaw, ½ nat. size, of the one-horned Rhinoceros (*Rh. indicus*), *Cuvier.* *Fig.* 4. Grinding surface of first true molar of the Java Rhinoceros (*Rh. sondaicus*). *Fig.* 5. Ditto of the *Rhinoceros bicornis.* *Fig.* 6. Ditto of the *Rhinoceros tichorhinus.* *Fig.* 7. Ditto of the *Rh. leptorhinus.* *Fig.* 8. Germ of a molar of *Rh. tichorhinus.* All the above figures of upper molars are reduced ½ in size: *o*, outer side; o^1 longitudinal ridge; *i i*, inner lobes; *b*, valley dividing the inner lobes; *e*, its termination which becomes wholly, or partially, or not at all insulated, according to the species; *c*, valley entering from outer side (it is marked *e*, in *fig.* 4). *f.* Promontary projecting into or crossing valley *b*. *Fig.* 9. Grinding surface of two molars of the lower jaw, ½ nat. size, of *Rhin. indicus.* *Fig.* 10. Four premolars, left side lower jaw, with symphysis in outline of the *Rhin. tichorhinus*, ¼ nat. size. *Fig.* 11. Four premolars left side, lower jaw, and symphysis of the *Rhin. leptorhinus*; ¼ nat. size. *Fig.* 12 (printed 1). Outline of the right intermaxillary bone of the two-horned Rhinoceros of Sumatra. (*Rh. Sumatranus*), ⅓ nat. size; *i* 1, first incisor; *i* 2, second incisor. *Fig.* 13. Portion of left superior maxillary bone of a young *Rhinoceros Indicus* showing *c* rudiment of a canine, and *p* 1 the hidden crown, exposed from without, of the first premolar. *Fig.* 14. Symphysis and part of lower jaw of a very young *Rhinoceros bicornis*, ½ nat. size, showing the germs of four incisors (*i* 1 and *i* 2 on each side); *d* 1, first deciduous molar; *d* 2, second deciduous molar. *Fig.* 15. Symphysis of lower jaw of a half-grown *Rhinoceros*

sumatranus; *i* 1, small mid-incisor; *i* 2, end of the germ of the large second or outer incisor; *d* 2, its deciduous predecessor about to fall; it has been shed on the opposite side; *d* 1, two small orifices above the mid-incisors, qu. remains of sockets of deciduous teeth? *Original.*

PLATE 139.

A section of the crown of the molar of a Rhinoceros, magnified 230 linear diameter: *t*, obliquely divided ends of the dentinal tubes; *d'*, peripheral contour of dentinal cells; *d''*, terminal and intertubular cellules; *l*, contour lines; *e*, enamel. *Original.*

PLATE 140.

Fig. 1. Right upper and lower jaws with the teeth and their nerves exposed from the inside, ½ nat. size, Hog, (*Sus scrofa*). *Fig.* 2. Deciduous and permanent teeth of right ramus lower jaw of a young Hog, ½ nat. size, exposed from the inner side. *Rousseau.* *Fig.* 3. Skull and teeth of the Barbiroussa, ¼ nat. size. *Original.* *Fig.* 4. Molar series, right side, upper jaw, nat. size, of an aged Wart-hog (*Phacochœrus Pallasii*): the first true molar has been worn out and shed, and the last premolar, *p* 4, brought into close contiguity with the second true molar, *m* 2. *Original.* *Fig.* 5. Upper molar of the *Chœropotamus Cuvieri*, nat. size. *Fig.* 6. Upper molar of the *Hyracotherium leporinum*, nat. size. *Fig.* 7. Upper molar of the *Hippohyus sivalensis*, nat. size. *Fig.* 8. Upper molar of the *Merycopotamus*, nat. size. *Original.*

PLATE 141.

Fig. 1. Deciduous and permanent teeth of the right side, lower jaw, of a young *Phacochœrus Æliani*. *Original.* *Fig.* 2. The permanent molar series of the adult, showing the worn-out state of the first true molar, *m* 1, nat. size. *Original.* *Fig.* 3. The permanent molar series of an Indian Wild Boar, showing the worn state of the first true molar, *m* 1, and a supernumerary first premolar, nat. size. *Fig.* 4. Skull and teeth of a Hippopotamus, ⅛ nat. size. *Original.*

PLATE 142.

Fig. 1. Cut surface; *fig.* 2, outer surface of a longitudinal section of the lower canine tusk of a Hippopotamus, which has been fractured and reunited at * *. *Original.* *Fig.* 3. A fossil premolar, nat. size, of a Hippopotamus; one of the three in the portion of jaw in the Woodwardian Museum, which is the original of the figure in 'Scilla, de Corporibus Marinis, tab. XII., fig. 1, 1747. *Original.*

PLATE 143.

Fig. 1. Fossil lower jaw and teeth, ¼ nat. size, of a not quite full-grown Hippopotamus (*Hexaprotodon*) from the Sewalik tertiary formations, showing the three incisors on each side of the symphysis, *i i*, which form its sub-generic character. *Fig.* 2. Lower jaw and deciduous teeth, ⅓ nat. size, of a very young *Hippopotamus amphibius*: *i*, incisors; *c*, canine; *d* 1, 2, 3, and 4, deciduous molars; *m* 1, first true molar. *Fig.* 3. Unworn crown of a true molar of the *Hippopotamus amphibius*, ½ nat. size. *Fig.* 4. The same ground down. *Original.*

PLATE 144.

Figs. 1 to 11 show the entire molar series

of one side of the lower jaw of the *Mastodon giganteus*, ¼ nat. size; 1 & 2 are the true deciduous molars; 3 is their vertical successor or the premolar, (the original was from the upper jaw). 4, 5, *d* 3, the last of the true deciduous series, which has no vertical successor. *Figs.* 6 & 7 first true molar (fifth tooth developed in succession). *Figs.* 8 & 9. Second true molar. *Figs.* 10 & 11. Third or last true molar. The originals of these figures are in the British Museum, and were obtained by Mr. Koch from newer tertiary deposits in Missouri, North America. *Fig.* 12, (marked 11 in the plate), a fragment of the upper jaw of the *Mastodon angustidens*, showing the deciduous molars, and the premolar, ⅓ nat. size. *Fig.* 13. Fore part of lower jaw of a young *Mastodon giganteus*, showing *d, i*, the deciduous incisive tusks; *d* 1, 2 & 3, the three deciduous molars, and *p* 1, outline of their vertical successor hypothetically added. *Fig.* 14. Fractured fore-part of the lower jaw of adult male *Mastodon giganteus*, ⅛ nat. size, showing *i* the permanent lower tusk on the right side. From the specimen in the British Museum. *Original.*

PLATE 145.

Fig. 1. Grinding surface of last lower molar, *in situ*, of the *Mastodon latidens*. *Fig.* 2. The same of *Mastodon Elephantoides*: both ½ nat size. *Clift.** *Fig.* 3. Grinding surface of a lower molar of the *Toxodon platensis*, nat. size, showing the partial disposition of the enamel *e e*; *d*, is the dentine; *c* the cement. *Original.*

PLATE 146.

Fig. 1. Vertical section of the skull of the Indian Elephant with the molars and incisive tusk of one side, the latter, *i*, showing its alveolus and pulp-cavity exposed by a longitudinal section. The dotted line through the fore-part of the pulp-cavity shows where a ball might penetrate that cavity and lodge at the opposite side, be there surrounded by osteo-dentine, then encased in ivory; and by progressive growth of the tusk, be afterwards carried in the direction of the arrow, into the middle of the solid exserted part of the tusk. The continuation of the dotted line shows how the ball, if it had penetrated the base of the tusk of a young Elephant, might ultimately be discharged. The semicircular line described round the central dot in the nasal cavity, gives the curve along which the molars advance in their revolving course from behind forwards. Part from *Cuvier*, part *Original*. *Fig.* 2. The penultimate molar and germ of the last molar exposed in the lower jaw of the Asiatic Elephant: *a*, the bony capsule or alveolus, which moves forwards with the tooth. *Fig.* 3. Right upper jaw of a very young Elephant, ⅛th nat. size. *Fig.* 4. A detached summit or digital process of a constituent plate of the molar of an Asiatic Elephant, nat. size; *p*, the open pulp-cavity at its base. *Fig.* 5. A detached plate of the same grinder, with a longitudinal section removed from one half, showing *d*, the dentine, *e*, the enamel, and *c*, the cement; nat. size. *Fig.* 6. Part of the longitudinal section of an Indian Elephant's grinder, showing the interdigitation of the constituent tissues; *d*, dentine; *e*, enamel; *c*, cement; *p*, is the common pulp-cavity; *r*, the beginning of a root. *Fig.* 7. Part of the longitudinal section of an African Elephant's grinder. *Fig.* 8.

* Geological Transactions, Vol. II, 1829.

Part of a transverse section of the tusk of an Indian Elephant, showing the decussating curved lines of the modified dentine or 'ivory'; *c*, the external cement. *Original.*

PLATE 147.

A section of part of the upper jaw, and the last molar tooth of a fossil Elephant (*Elephas planifrons. Falconer*) from the Himalayan tertiary deposits; *a a*, the common body of dentine; *b*, the enamel covering the coronal lamelliform processes of dentine; *c*, the thick mass of cement filling the intervals of those enamelled processes, and accumulated upon them in the hinder unworn part of the molar: *d d*, the roots of the molar. By some unusual accident to the lower opposing tooth of the molar of the opposite side, *r*, it has not suffered abrasion, but has preserved the mammillated summits of all its plate entire and projecting beyond the level of the grinding surface of the molar in use. *Fig.* 2. Shows the difference in the surfaces of the right unworn grinder *r r*, and of the worn left grinder *l l*; *a*, dentine; *b*, enamel; *c*, cement; $\frac{1}{3}$ nat. size. From the specimen presented by Captain Cautley to the British Museum. *Original.*

PLATE 148.

Fig. 1. Side view of first upper molar of Indian Elephant. *Fig.* 2. Grinding surface of same; both nat. size. *Fig.* 3. Grinding surface of penultimate lower molar of Indian Elephant. *Fig.* 4. The same of an African Elephant. *Fig.* 5. Unusually large last lower molar of the mammoth, (*Elephas primigenius*). *Fig.* 6. Penultimate lower molar, of the more normal form and structure of a mammoth. *Fig.* 7. Part of an upper molar of a mammoth, shewing the transverse ridges on the margins of the coronal plates. *Fig.* 8. Much worn molar of a mammoth. *Figs.* 3 to 8 are $\frac{1}{3}$ nat. size, and in each; *d*, is dentine; d^1, the same worn down to common base; *e*, enamel; *c*, cement; *f*, digital summits of coronal plates; *r*, root. *Original.*

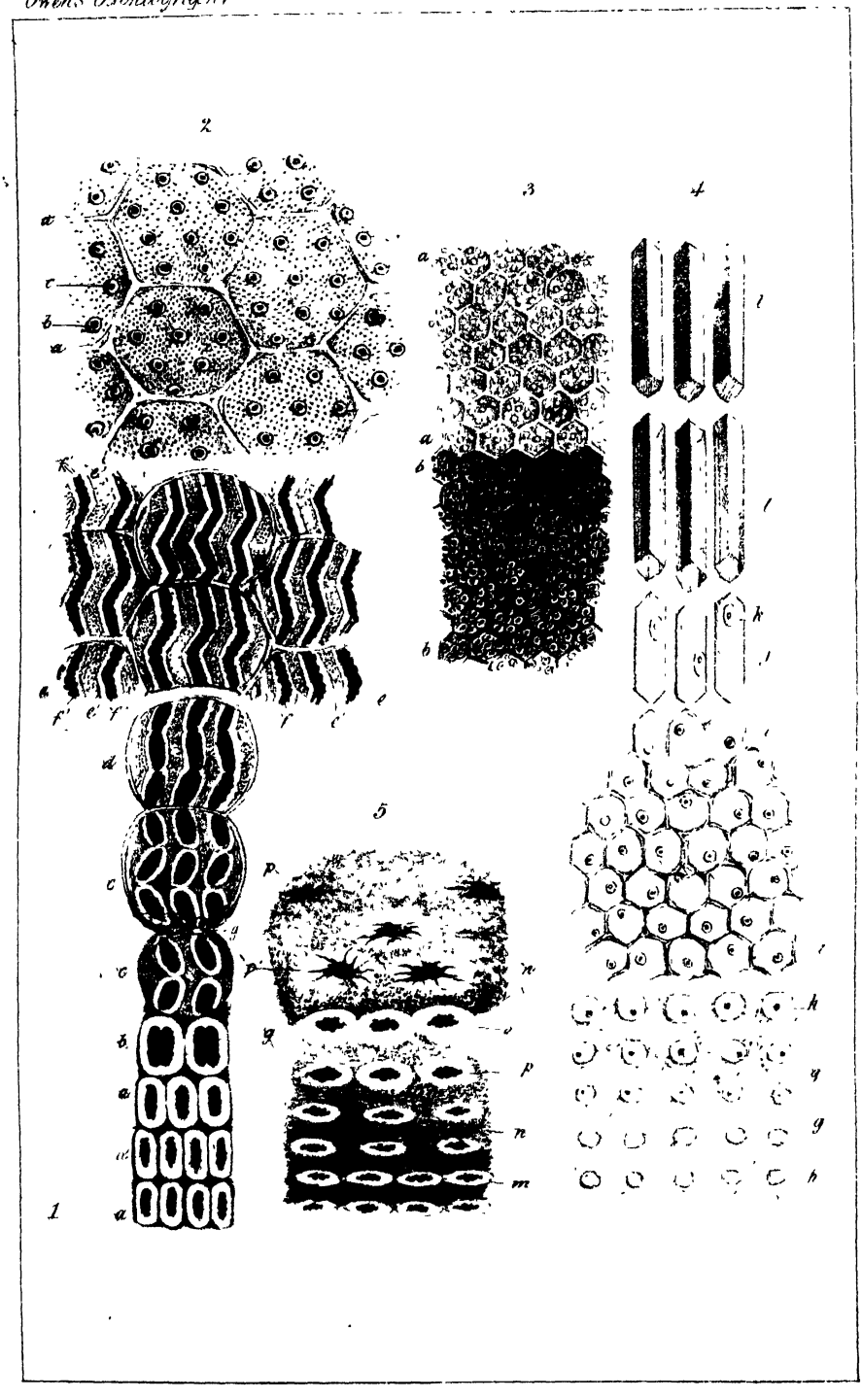
PLATE 149.

A section of the tusk of an Indian Elephant, magnified 250 linear diameters, showing the microscopic structure of ivory. *Original.*

PLATE 150.

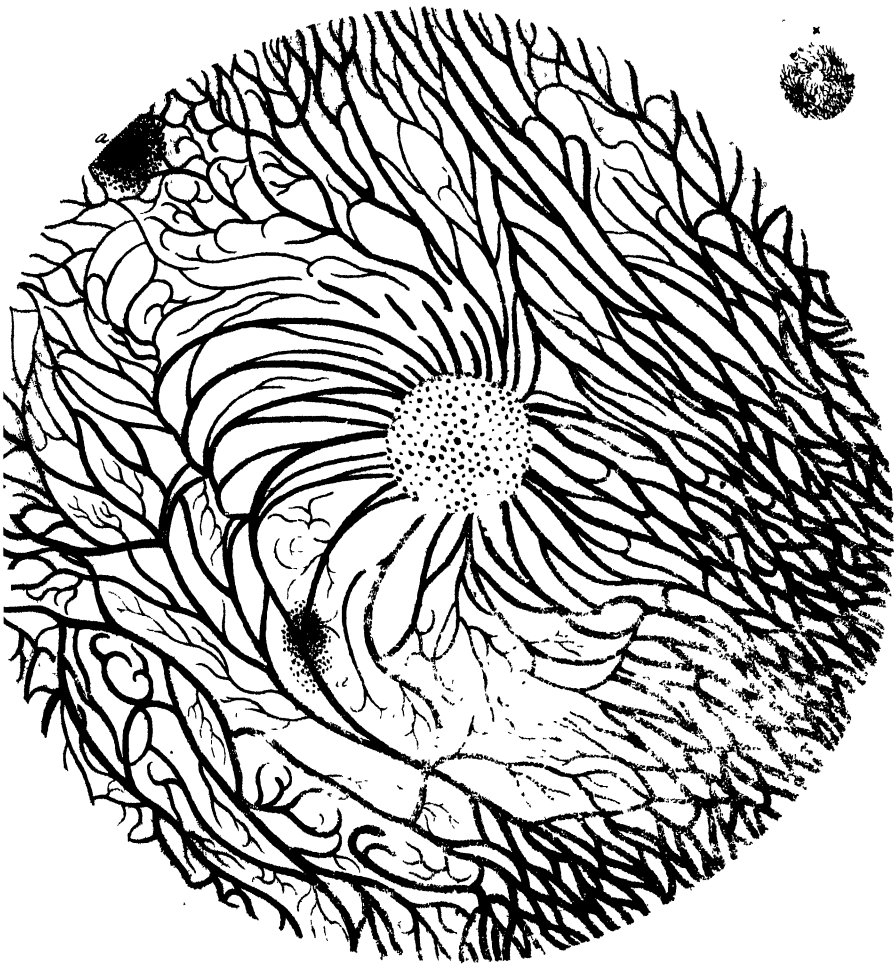
Fig. 1. A section of a part of the exterior of the root of a molar of the Indian Elephant, magnified 600 linear diameters; *d*, dentine; d^1, dilated terminations of the undulated tubes; c^1 radiated cell of cement; c^{11}, cemental tubes. *Fig.* 2. Longitudinal section of the end of a root of the molar of an Indian Elephant, magnified 230 linear diameters; *d*, dentine; *c c*, cement. *Original.*

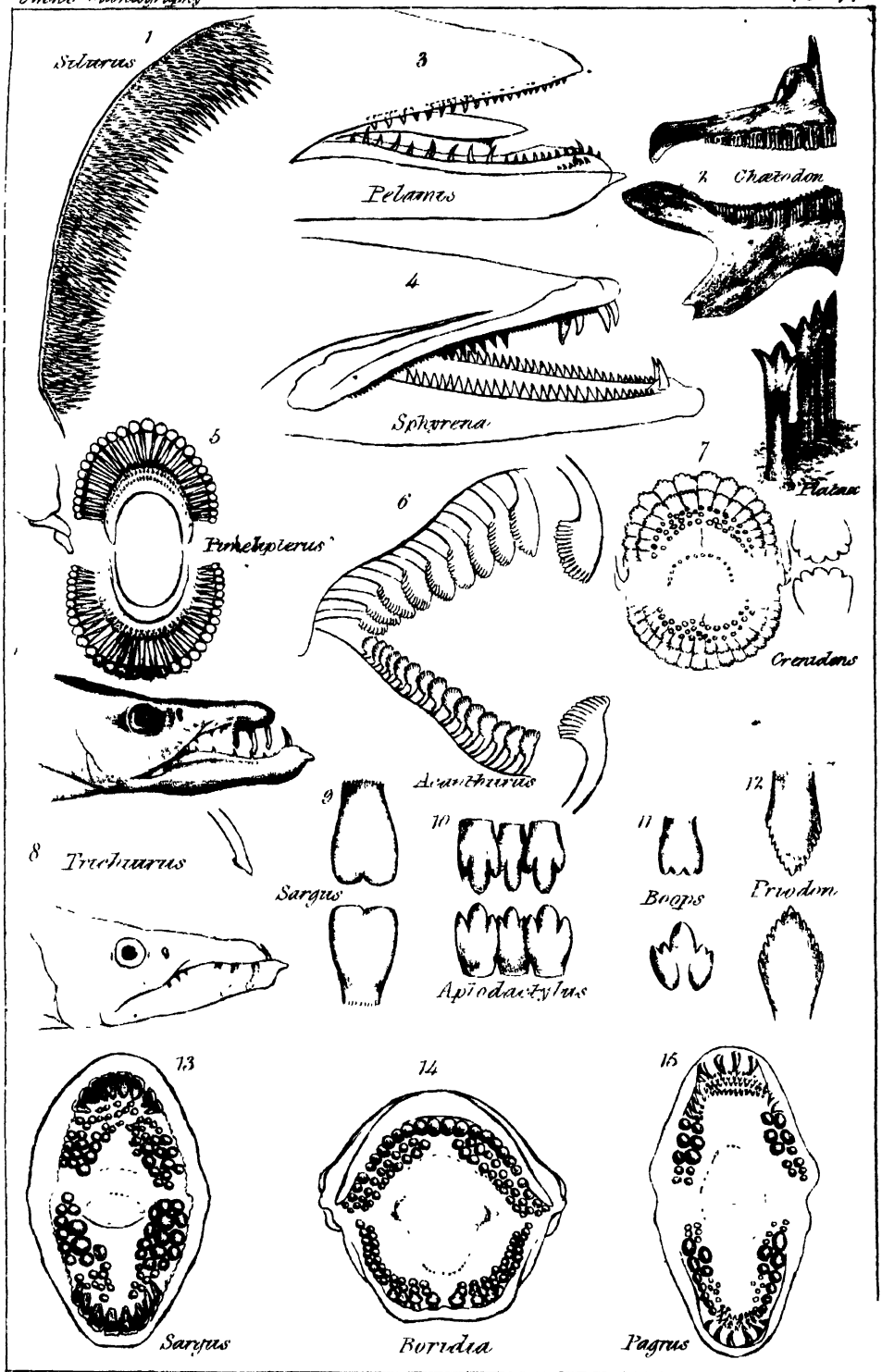
Note by Publisher.—In the foregoing list, Numbers 1, 2, 70, 73, 75, 87, 89, 113, 119, 122, are repeated twice, and Numbers 62, 63, 64 and 65, thrice, making a total number of 168 plates.



DEVELOPEMENT OF DENTAL TISSUES

R. Owen del. et fec. on Stone by J. Erxleben
Day & Haghe, Lith.rs to the Queen
London. Published by H. Bailliere, 1845

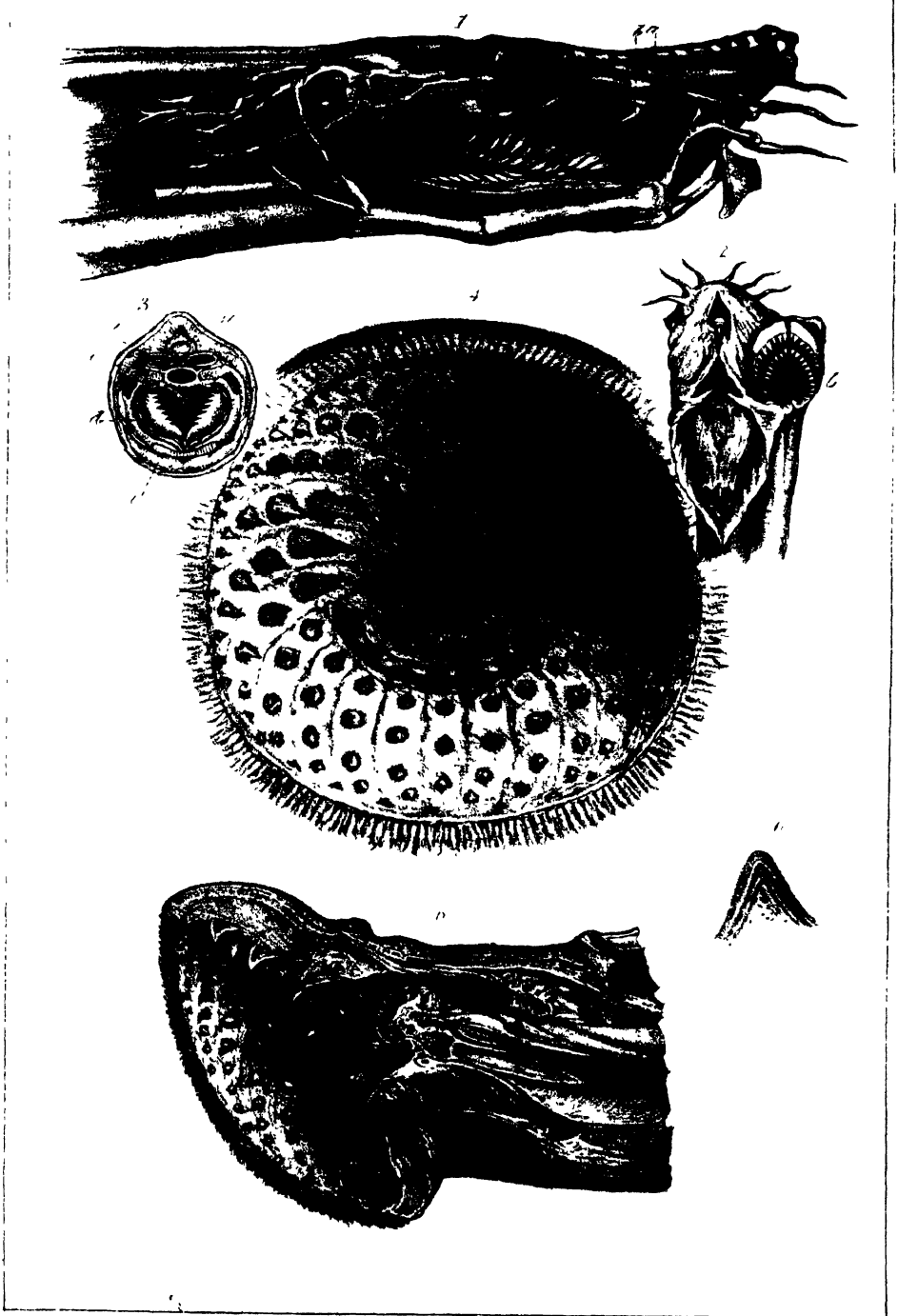




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VARIOUS FORMS of TEETH in FISHES

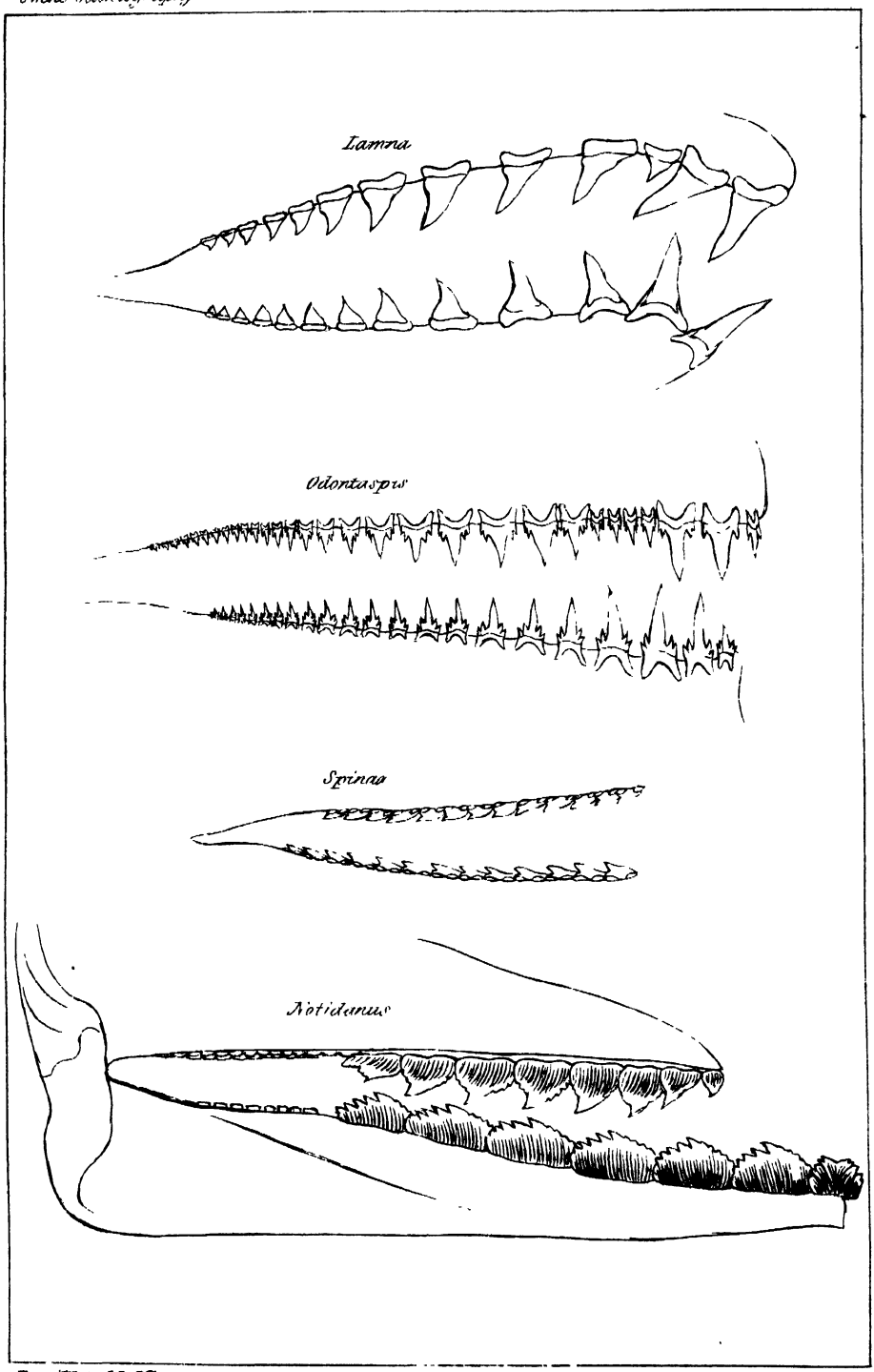


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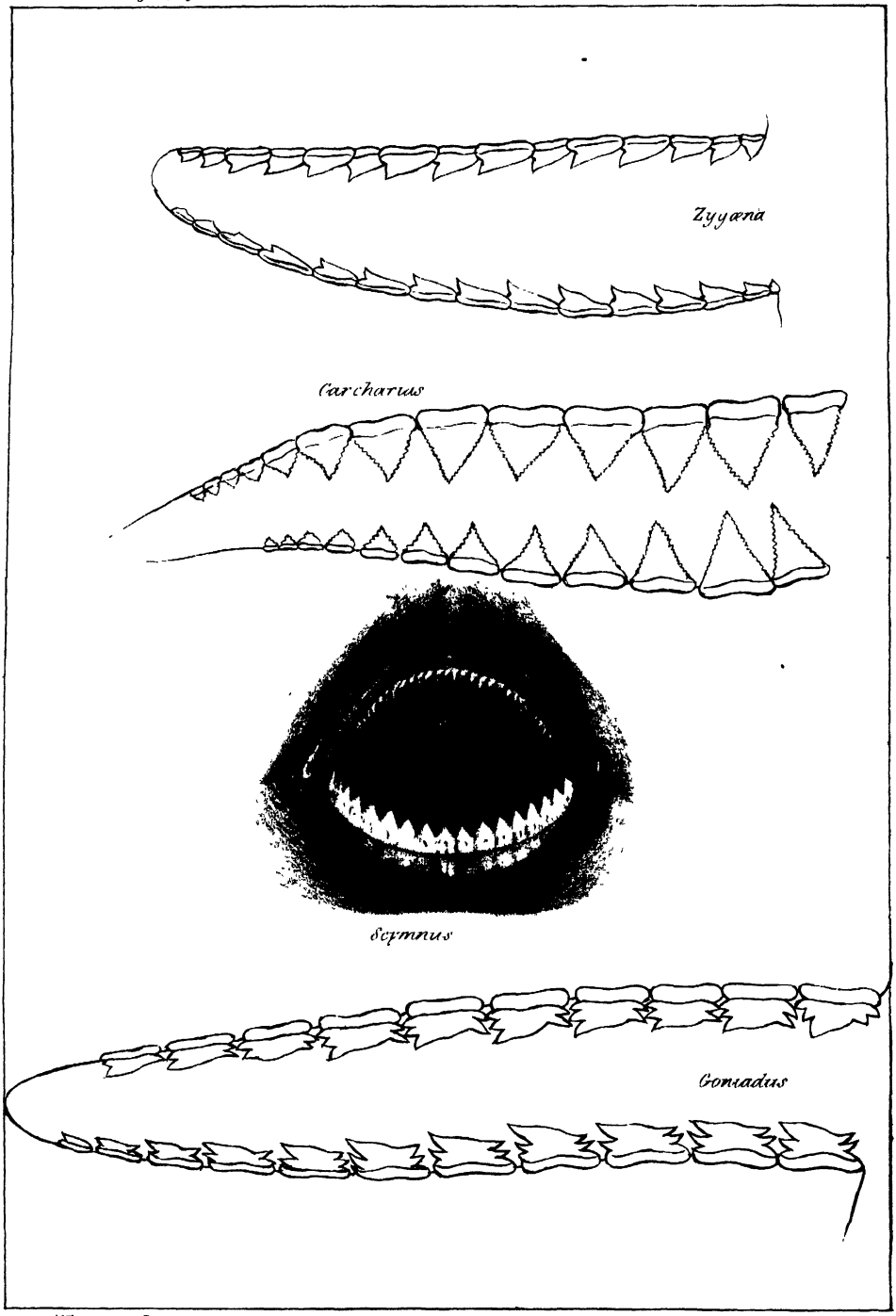
CYCLOSTOMES

London Published by R. Baldwin 1840



SQUALOIDS.

London. Published by H. Baillière, 1840

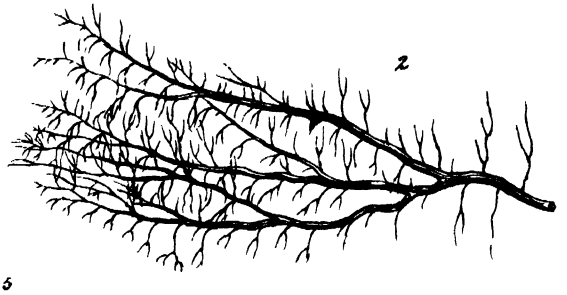


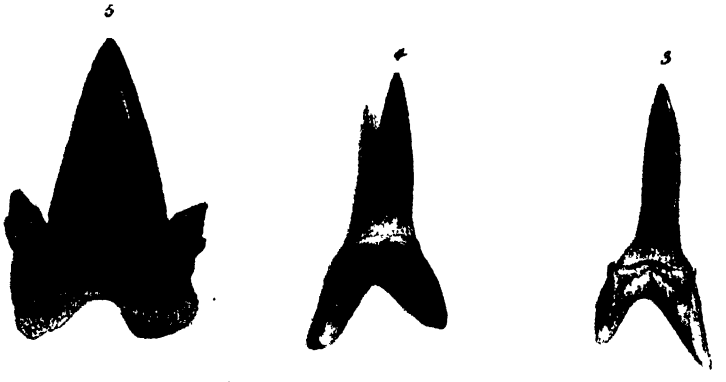
Jane Aldous, del. et lith.

Day & Haghe, lith.rs to the Queen.

SQUALOIDS.



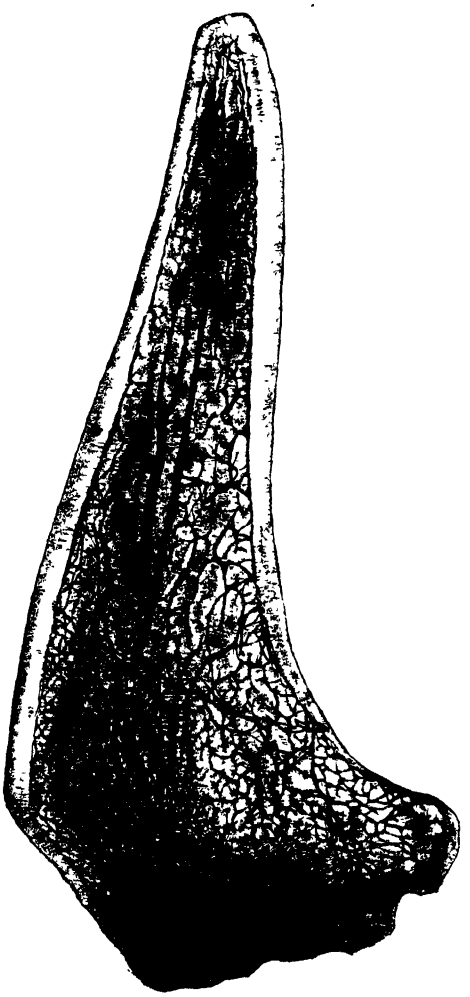




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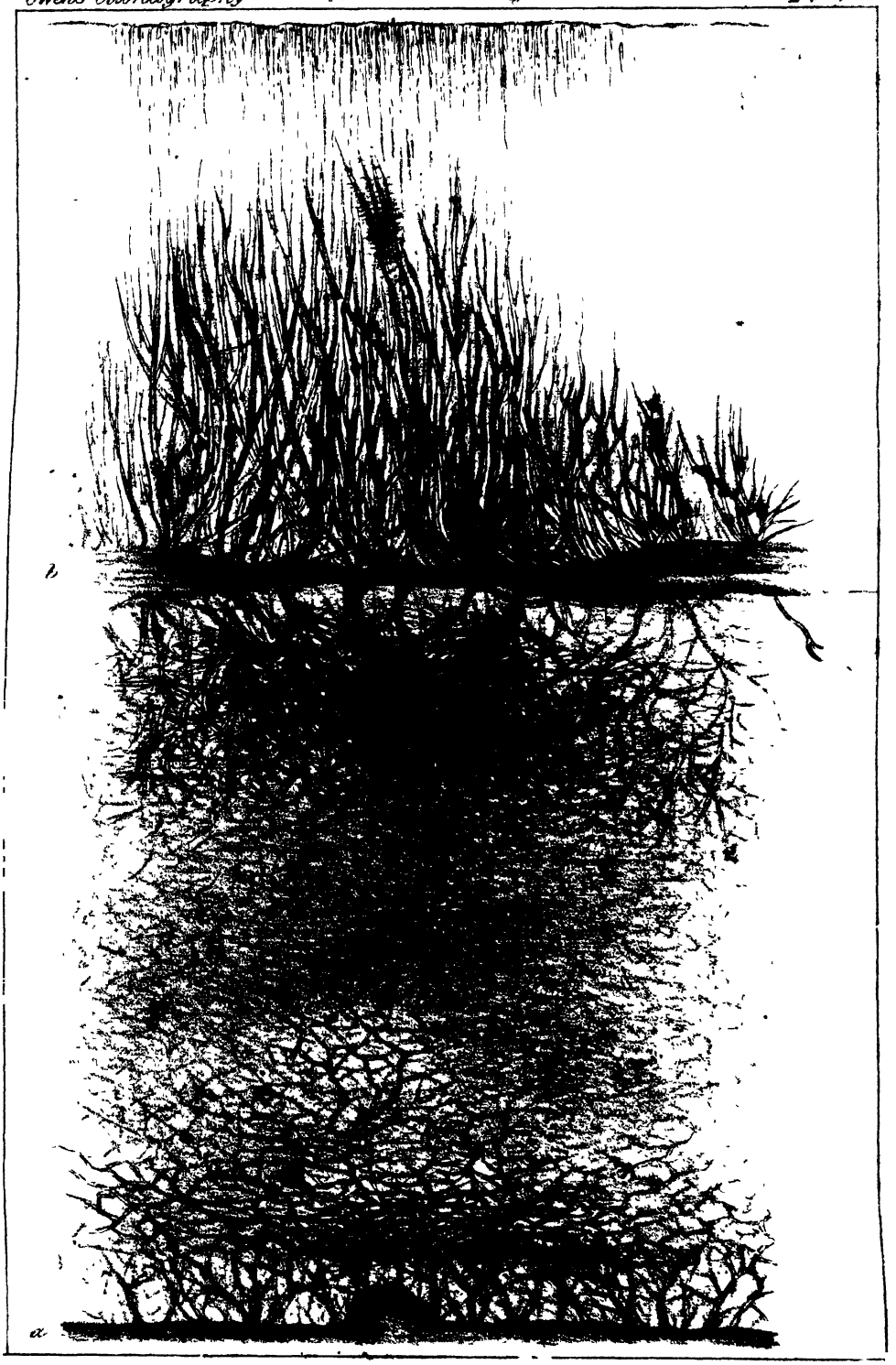
London. Published by H Bailliere (1840)



Lewis Aldous Junr. Dr. C. Hughes' Mth. to the Crown

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Published by H. Baillière, 1840

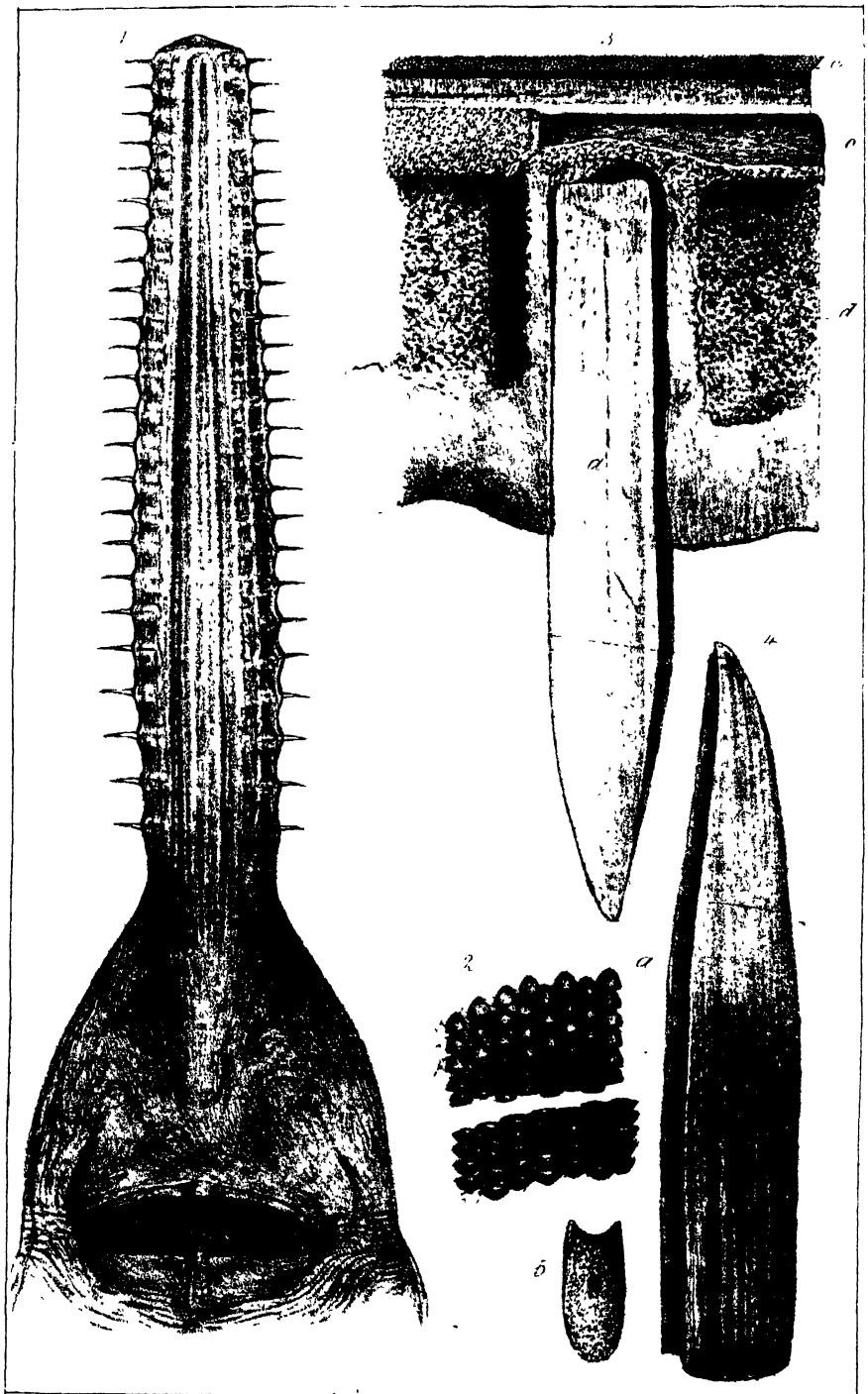


Trans Athenæum Zool.y

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Day & Haghes Lith.rs to the Queen

Published 1st Feb.y 1840



Lewis Adams, del. et sc.

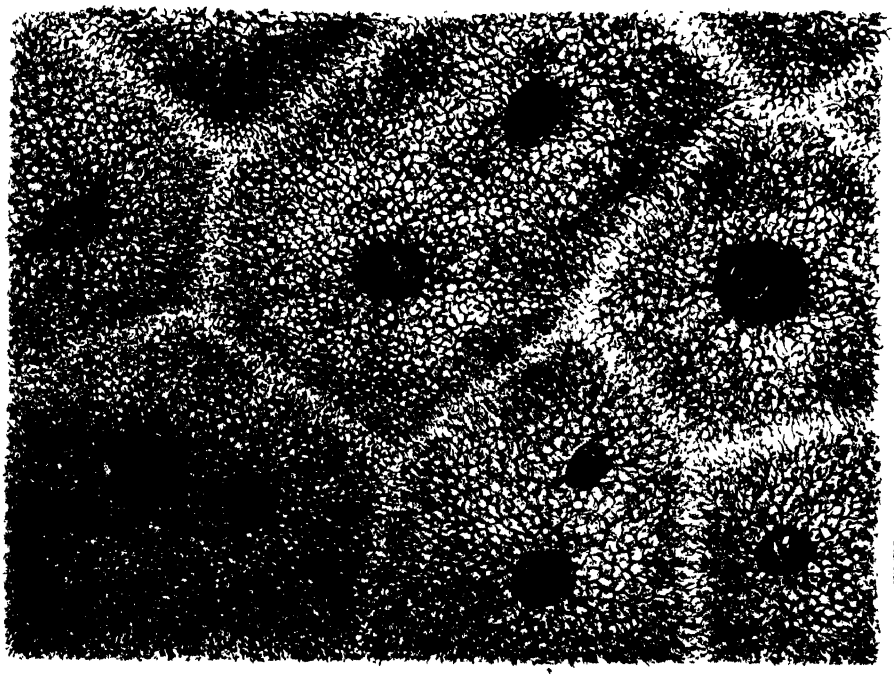
Day & Haghe, Lith.rs to the Queen.

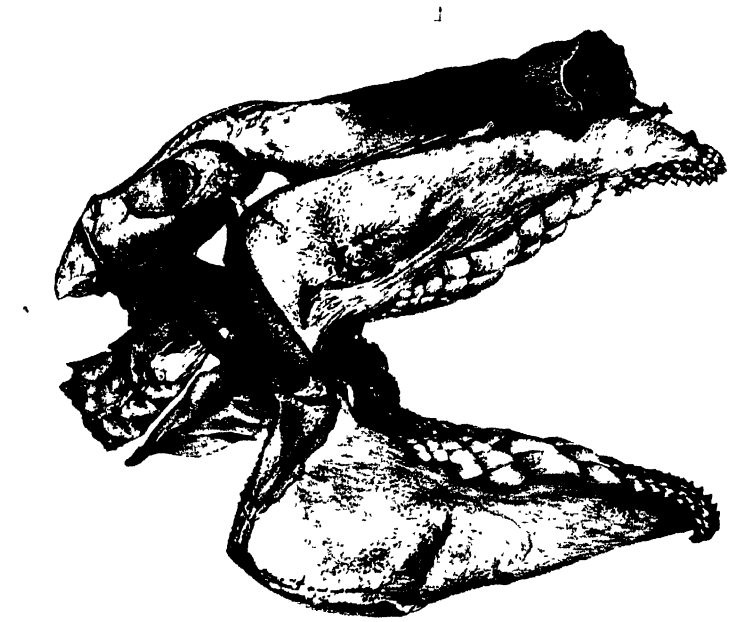
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Dens Aldrovas. del & lith

Day & Haghe, Lith^rs to the Queen

1 CESTRACION 2 SQUATINA.

Lith. Printed by C. Hullmandel 1840



HYBODUS



Lowe Aldous, del et lith.

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ILLUSTRATION

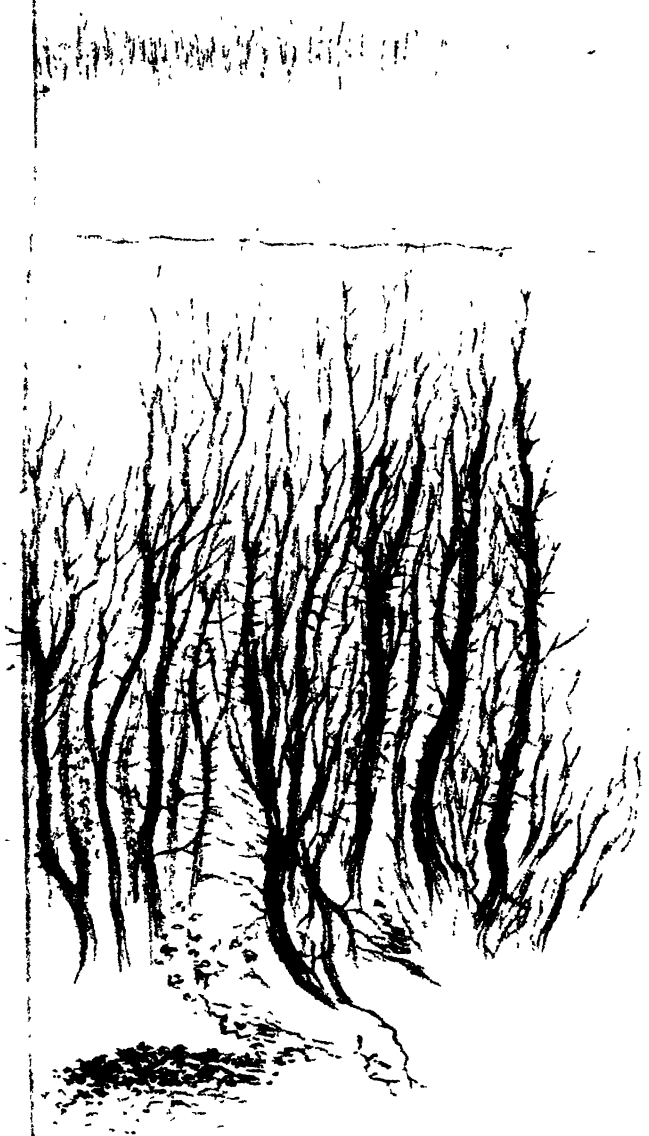


CESTRACION PHILIPPI





ACRODU



Drawn & Etched by Lieut. Alexander

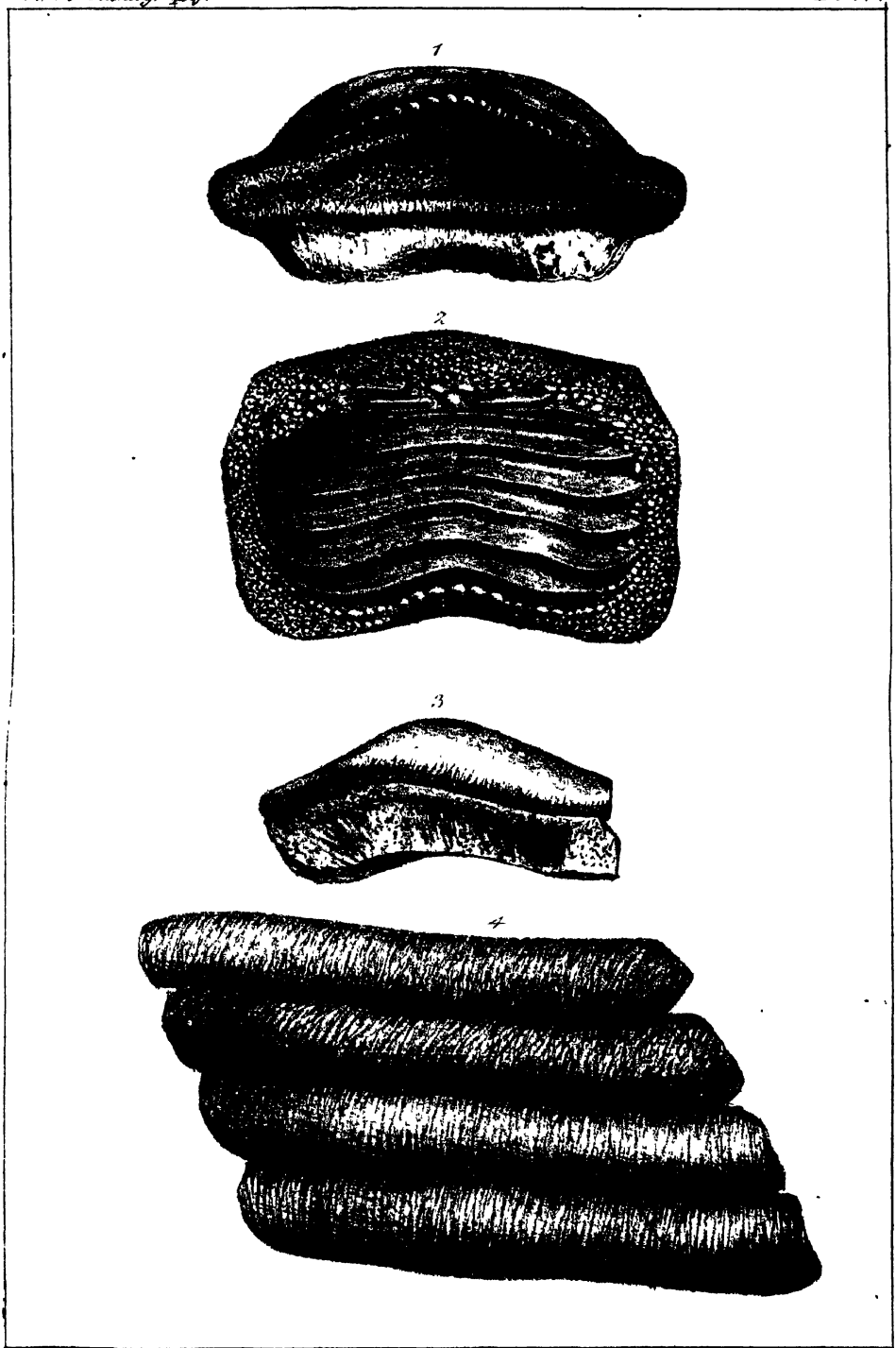
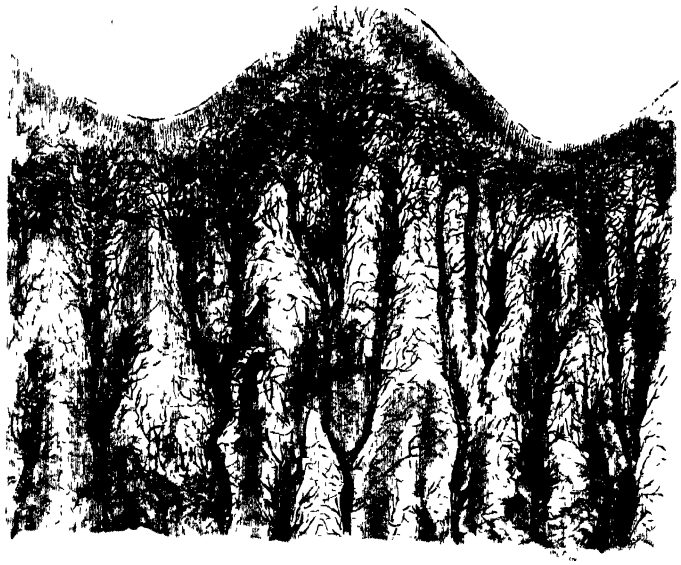


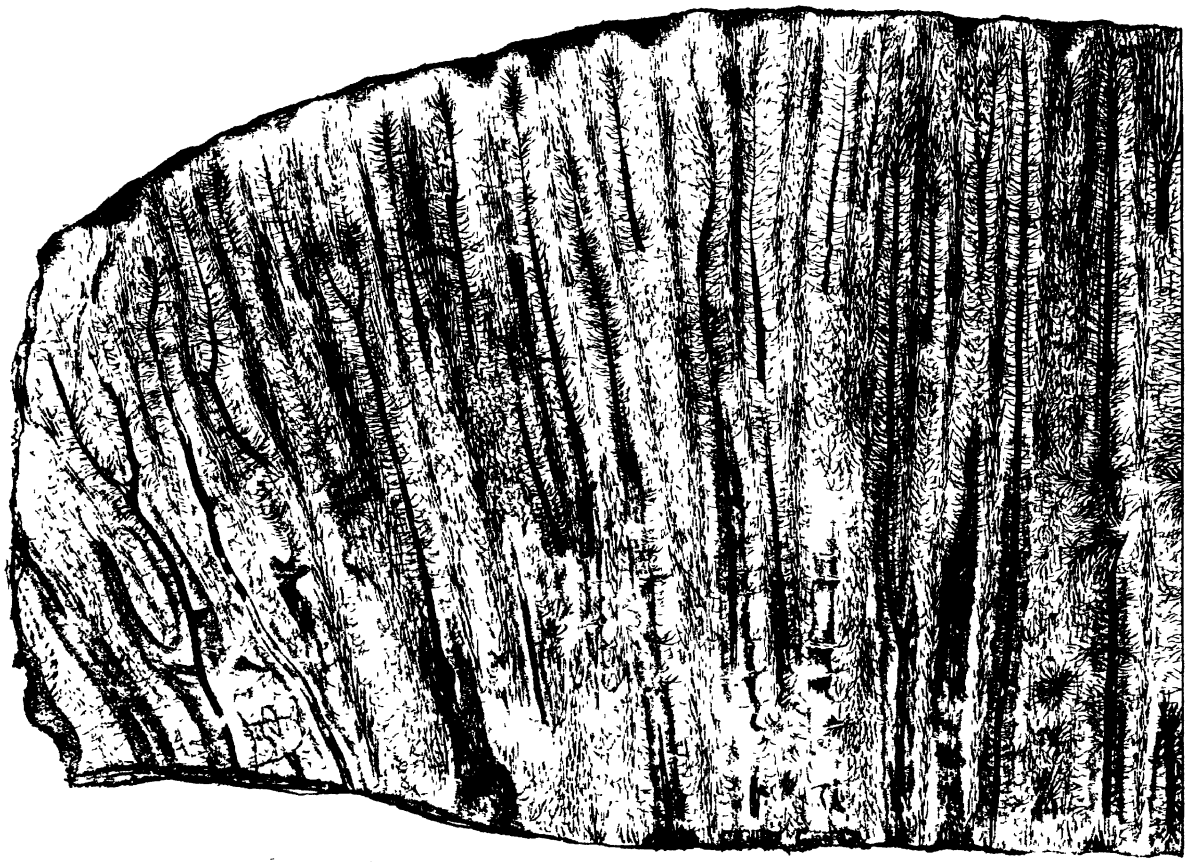
Fig 1 & 2. PTYCHODUS. 3 PSAMMODUS. 4 STROPHODUS.

London Published by H Baillière, 1840.









PSAMMODUS MAGNUS



Lewis & Adlows del et lith.

Day & Haghe Lith.rs to the Queen

PSAMMODUS

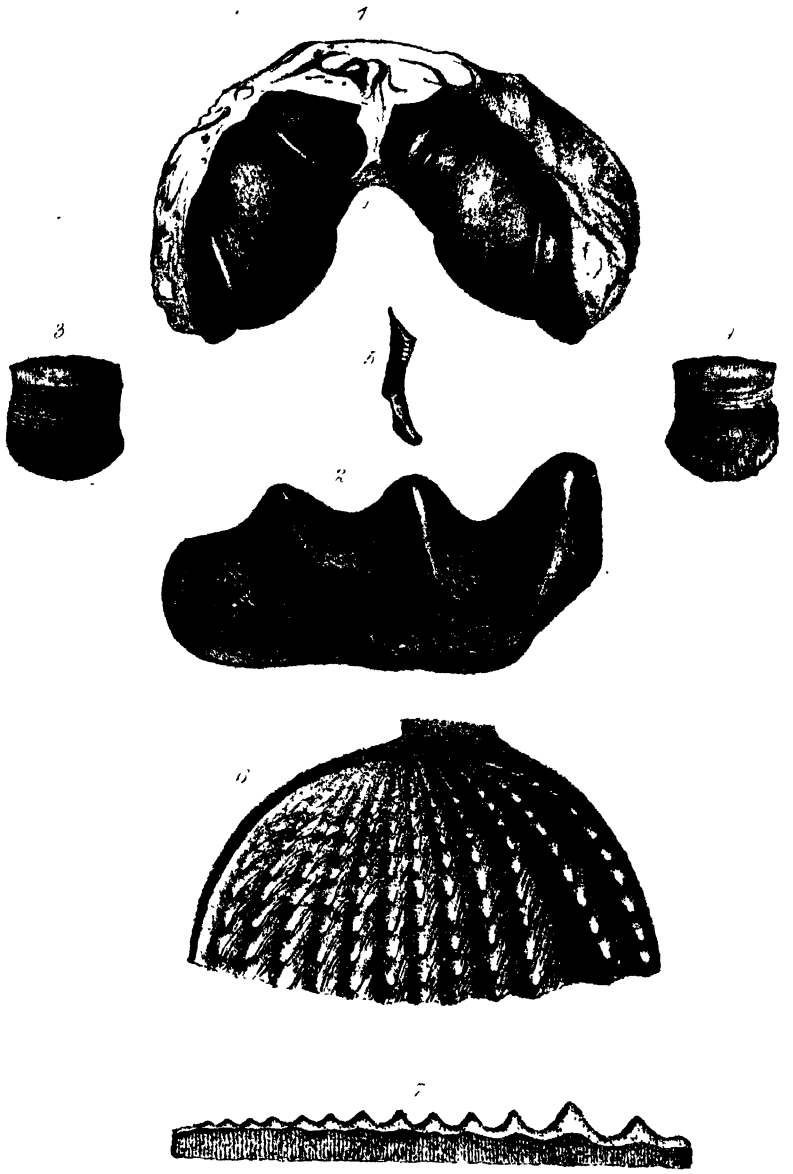
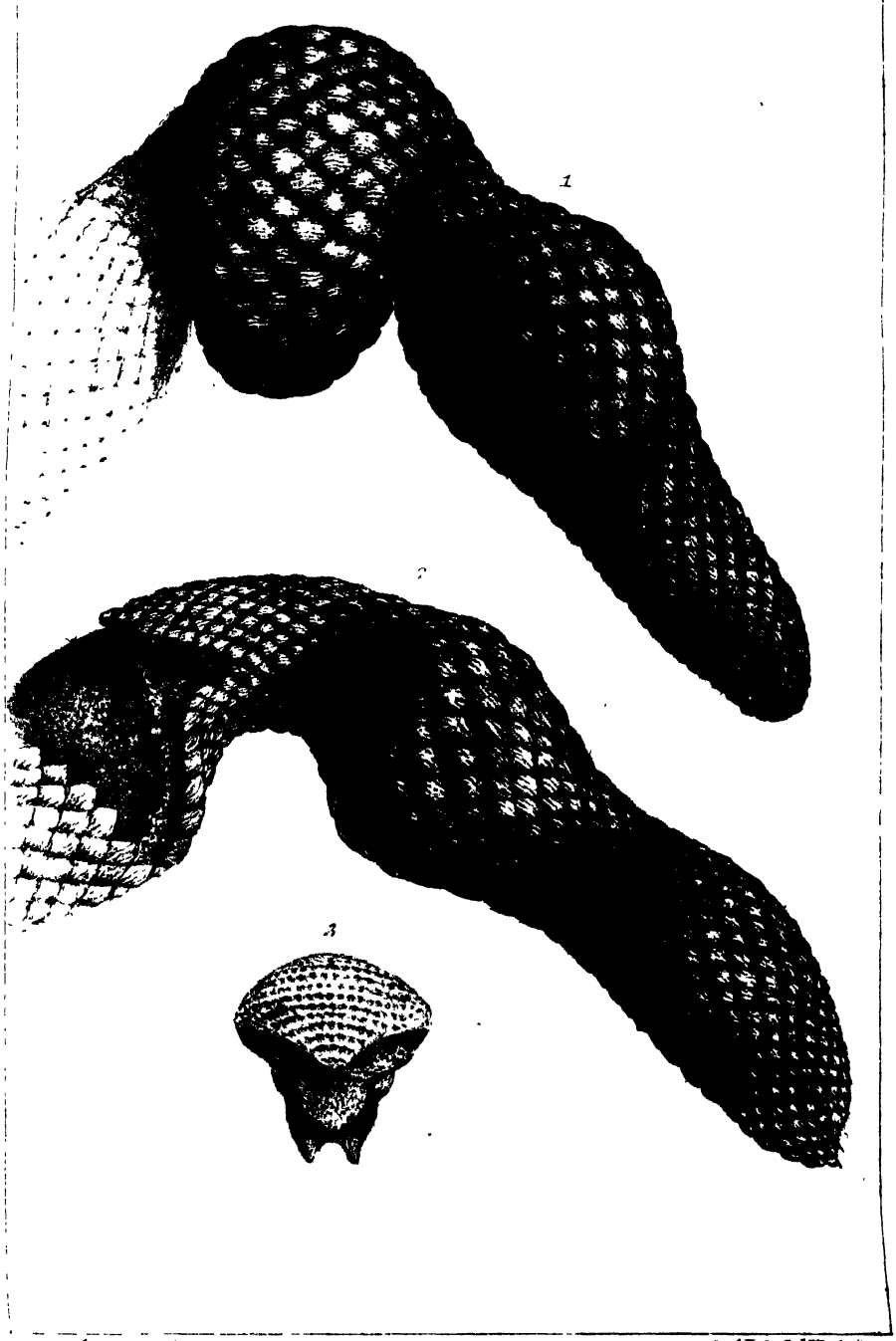


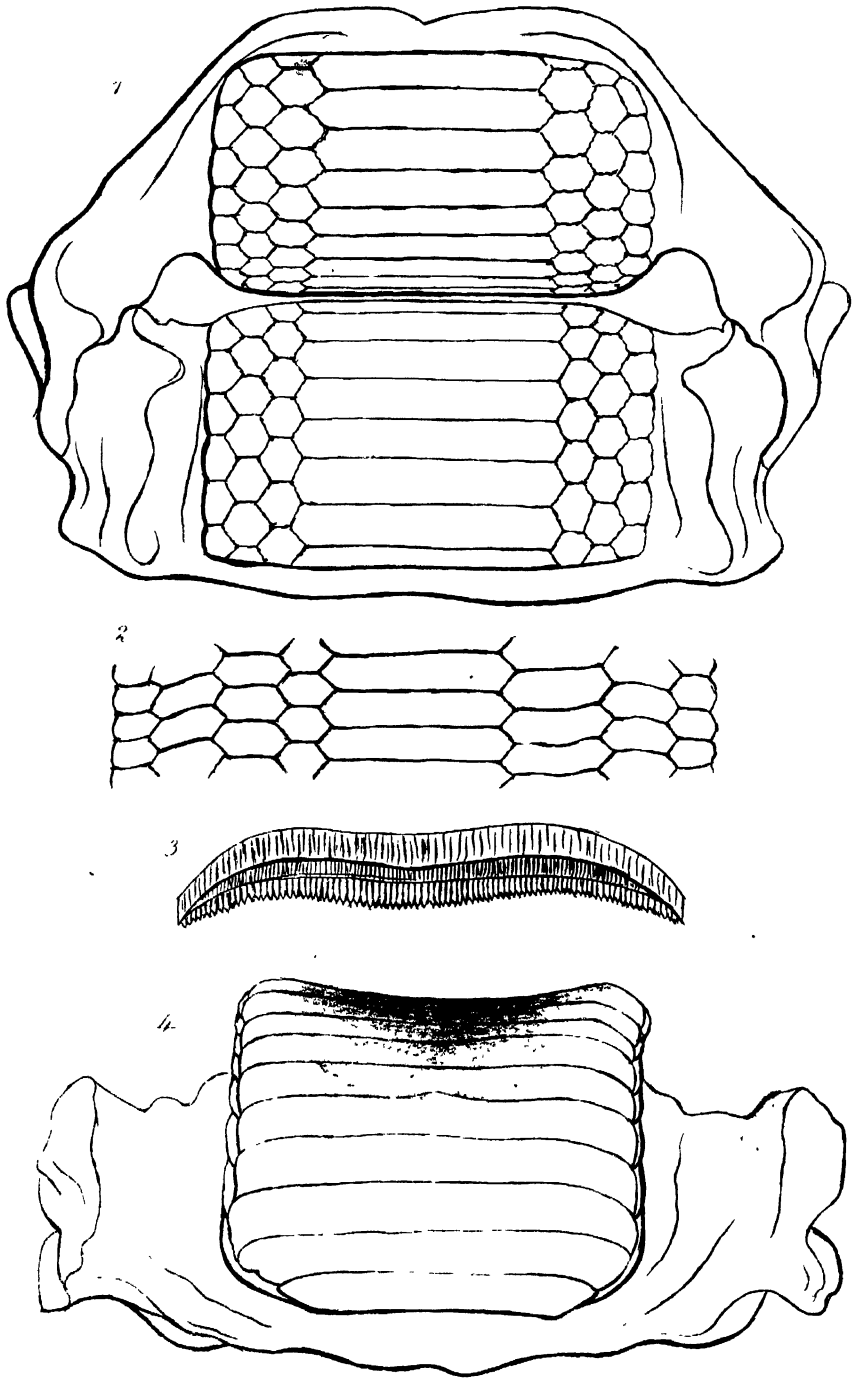
Fig. 1. COCHLIODUS. 2. CERATODUS. 6. 7. TEETH.
3.4.5. PETALODUS.



RHINA

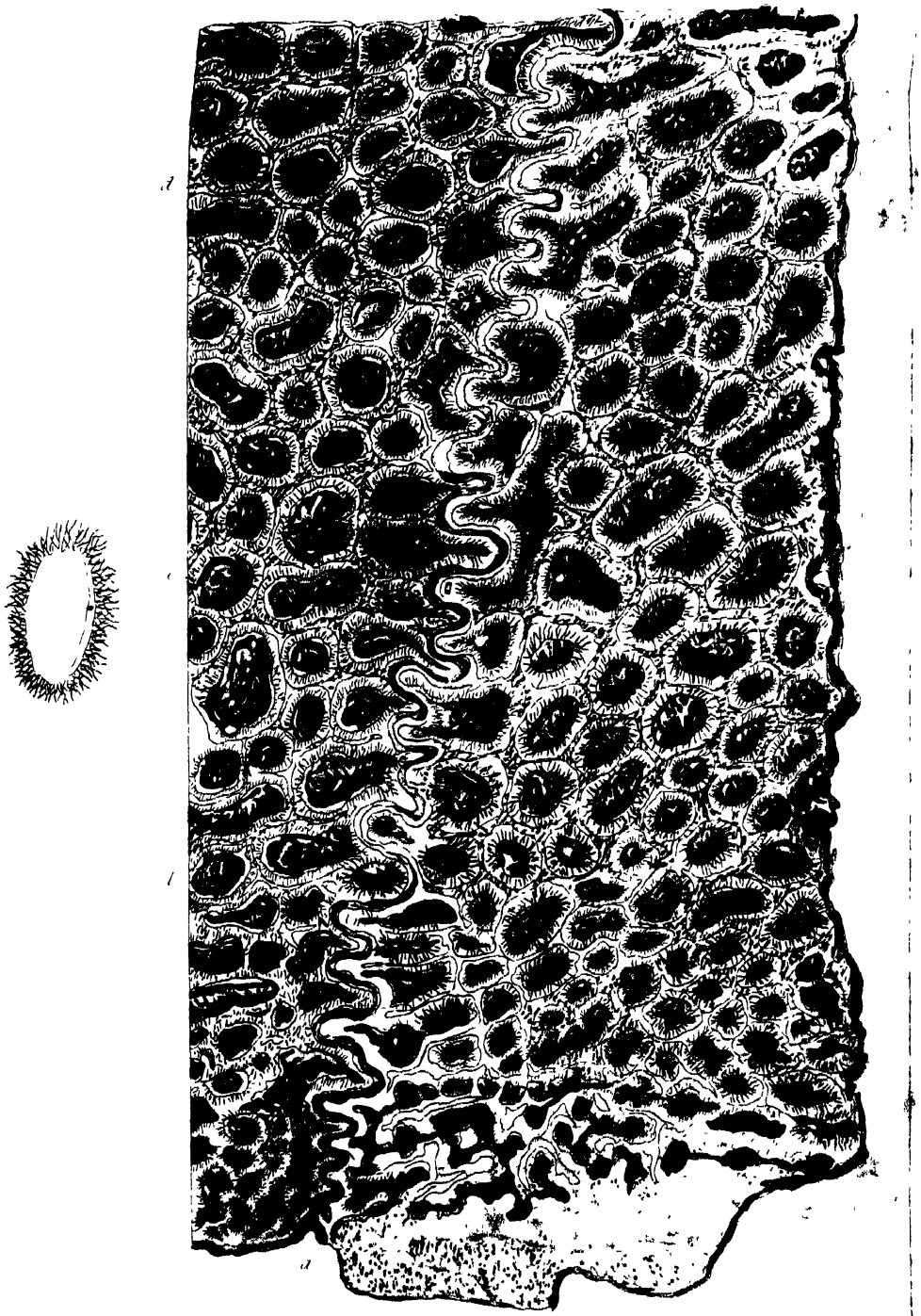


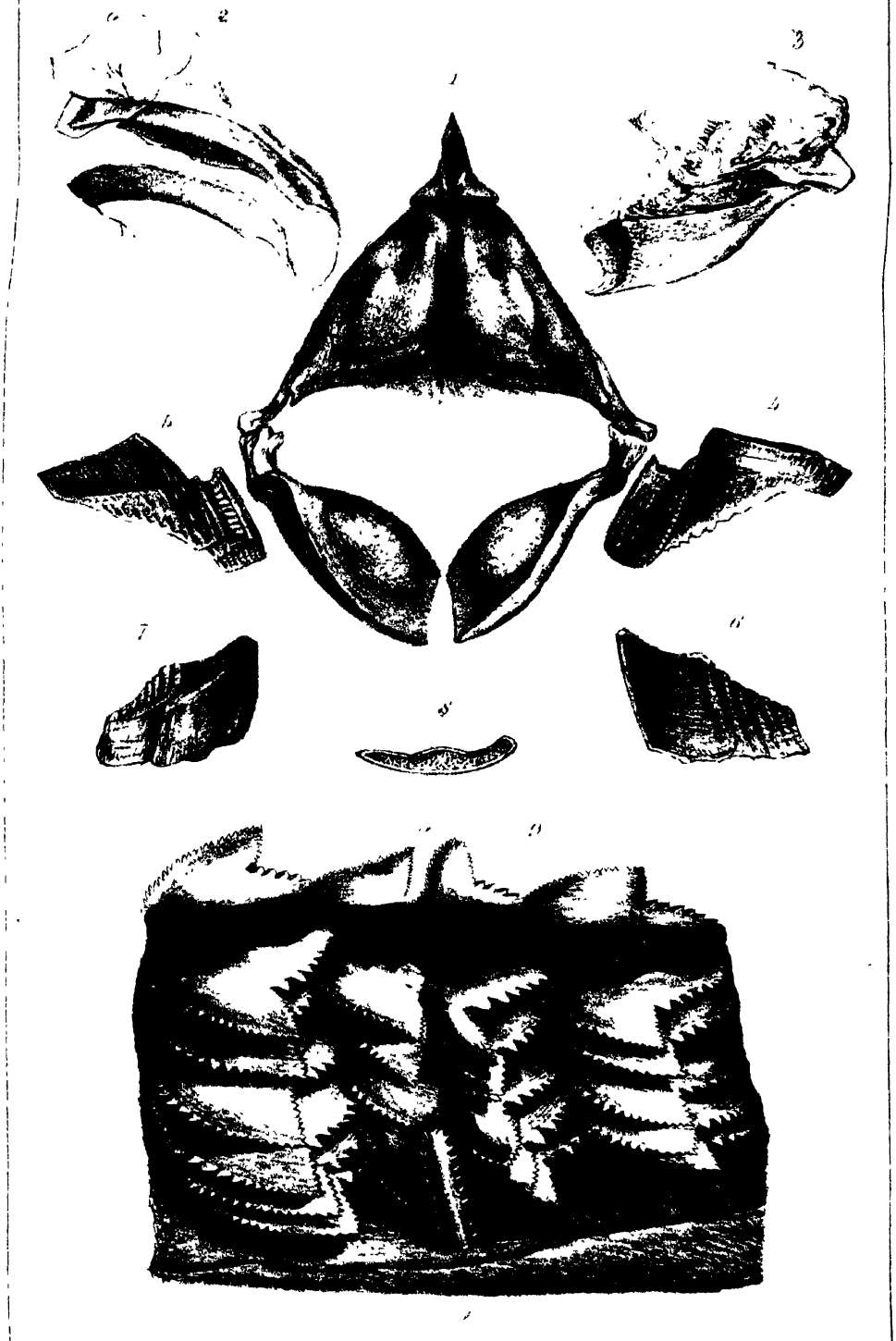
RHINA



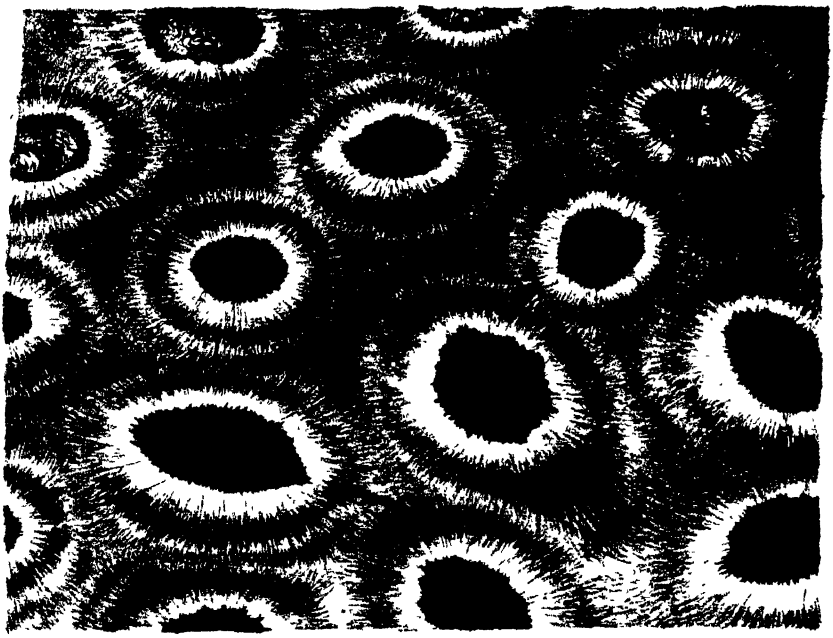
1. MYLIOBATIS. 2. TYCHOBATIS. 3, 4. AETOBATIS.



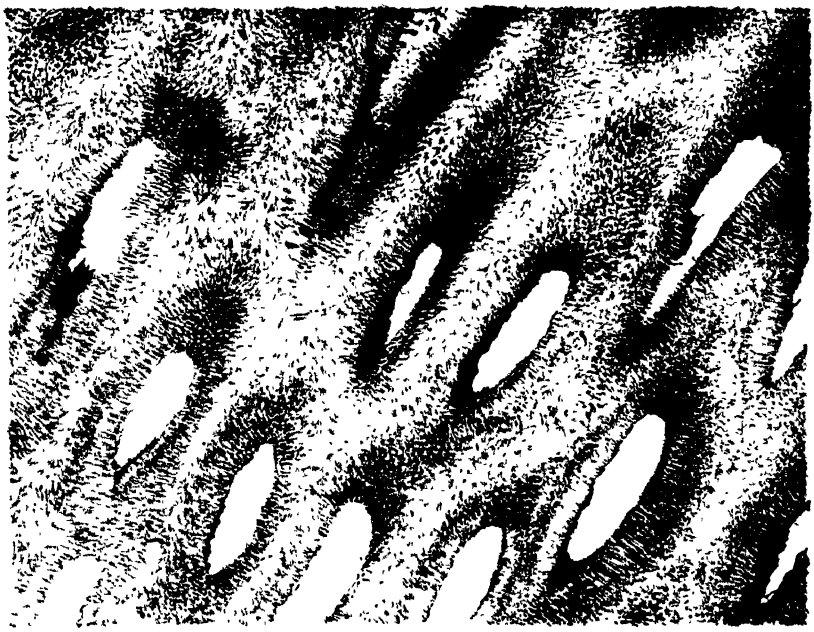




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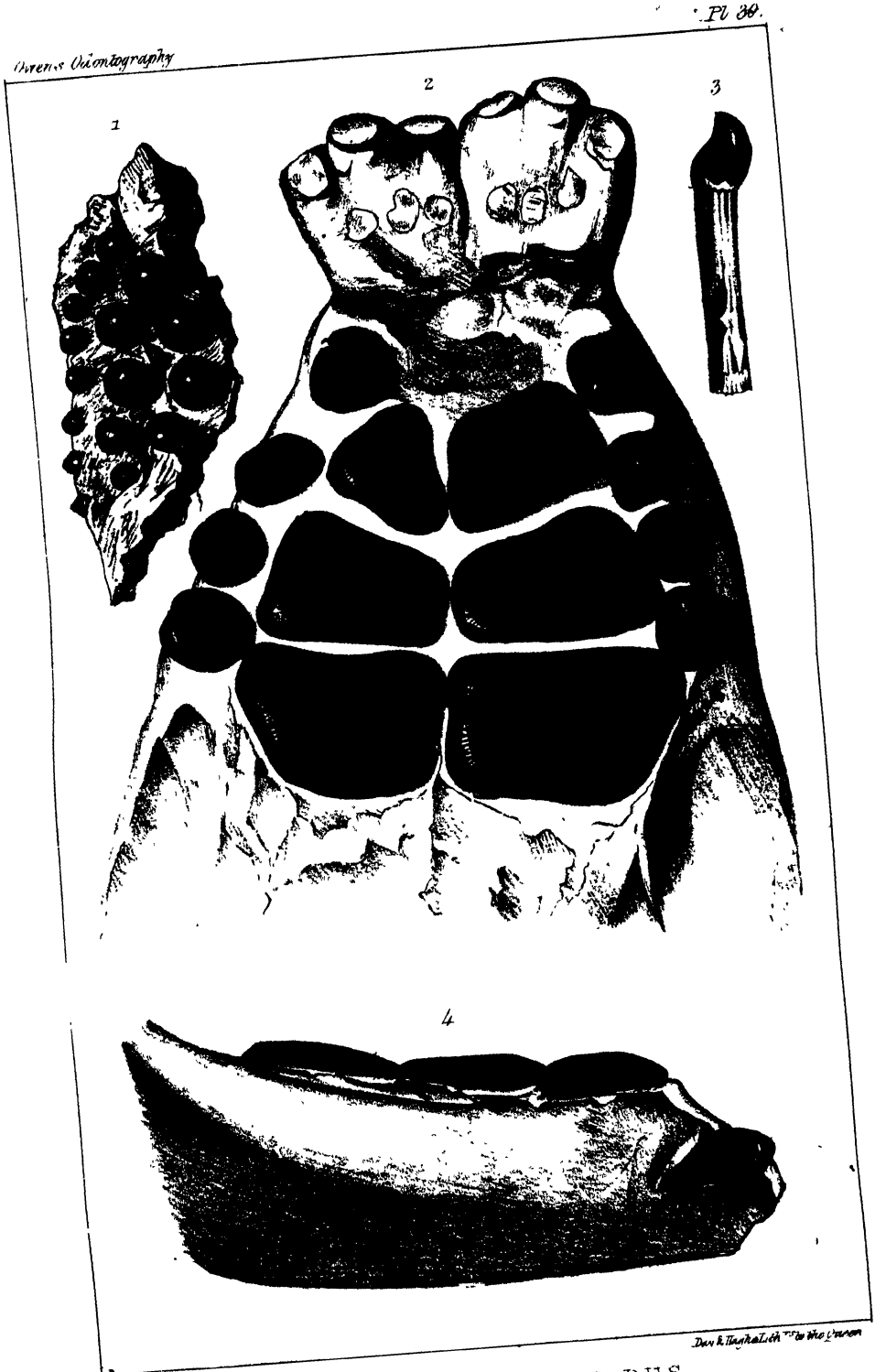


2



CHIMERA

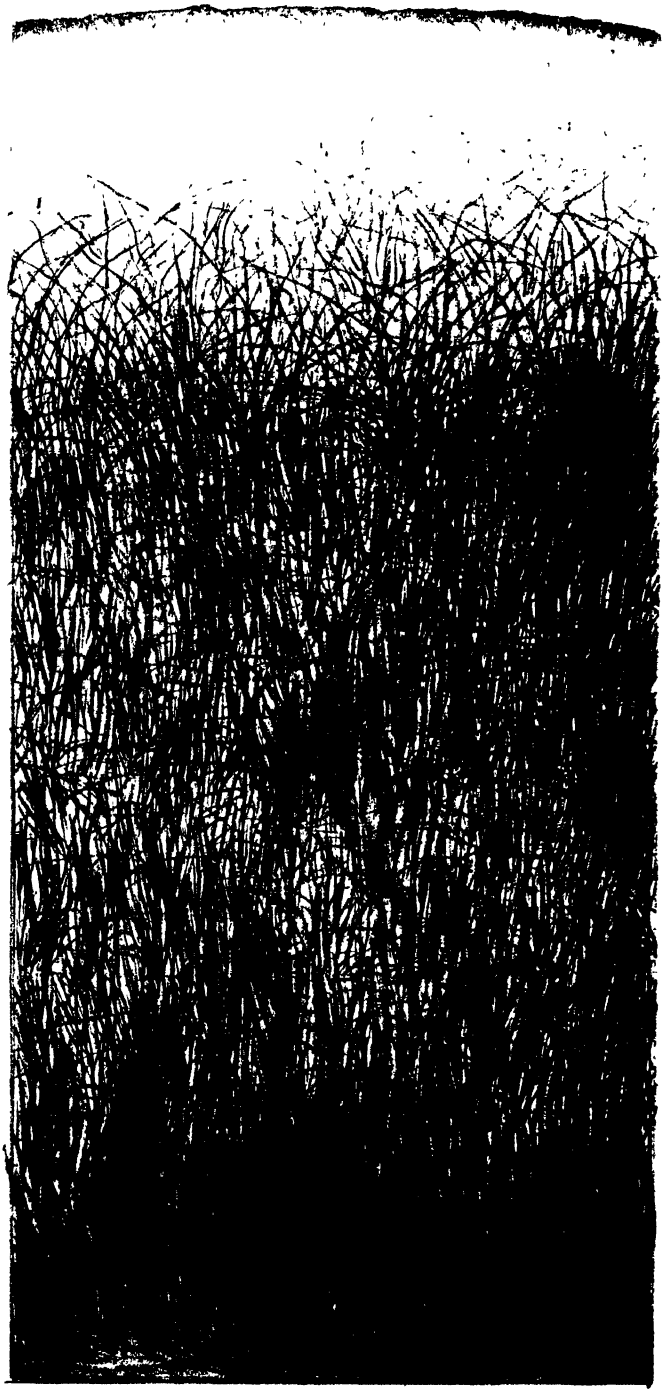
Owen's Odontography



Dan'l Maclise, del. et lith.

Day & Haghe Lith.rs to the Queen

1 LEPIDOTUS — 2 3 4 PLACODUS.

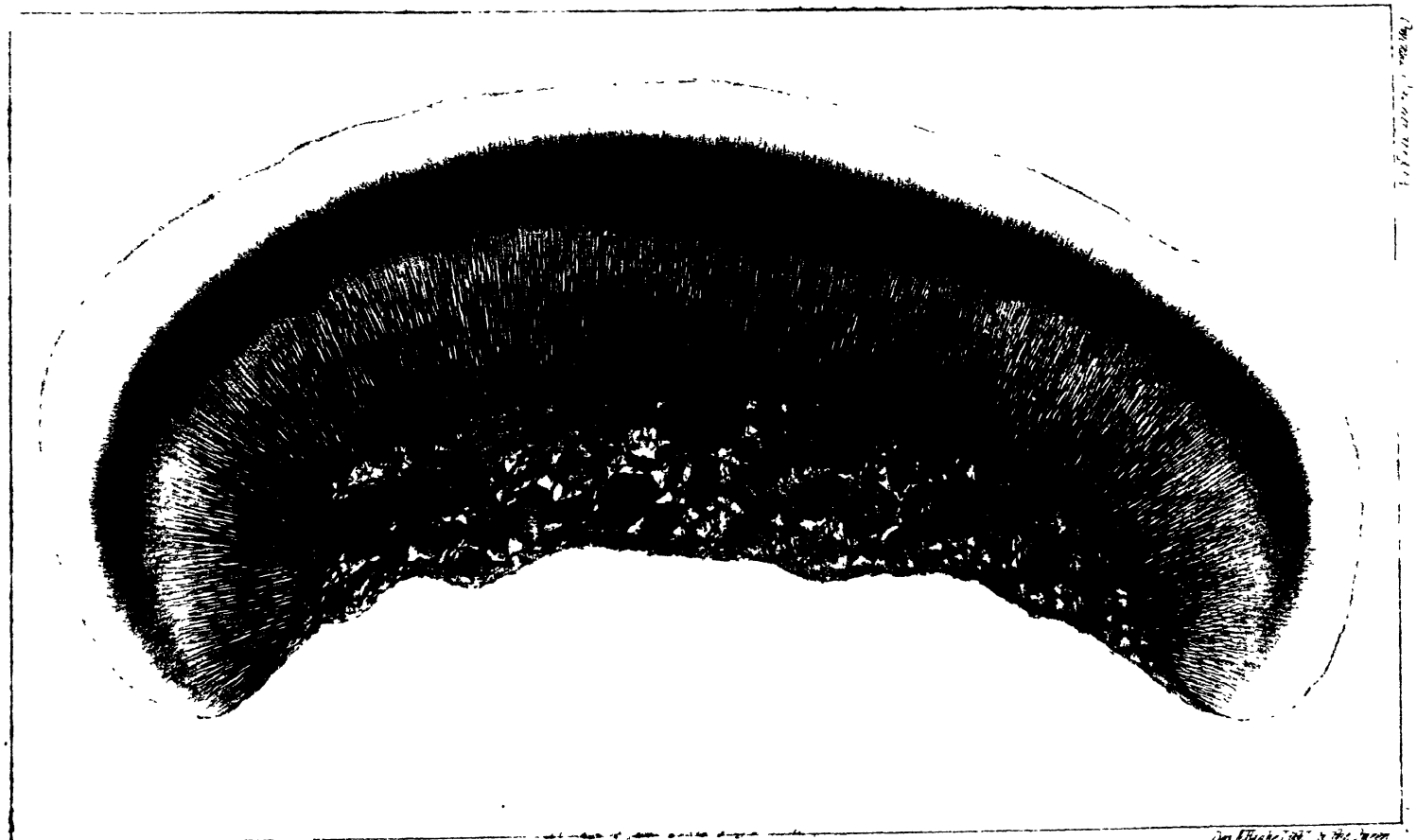


Jens Hadow. del. & Sculp.

Day & Haghe, Lith.rs to the Queen

LEPIDOTUS

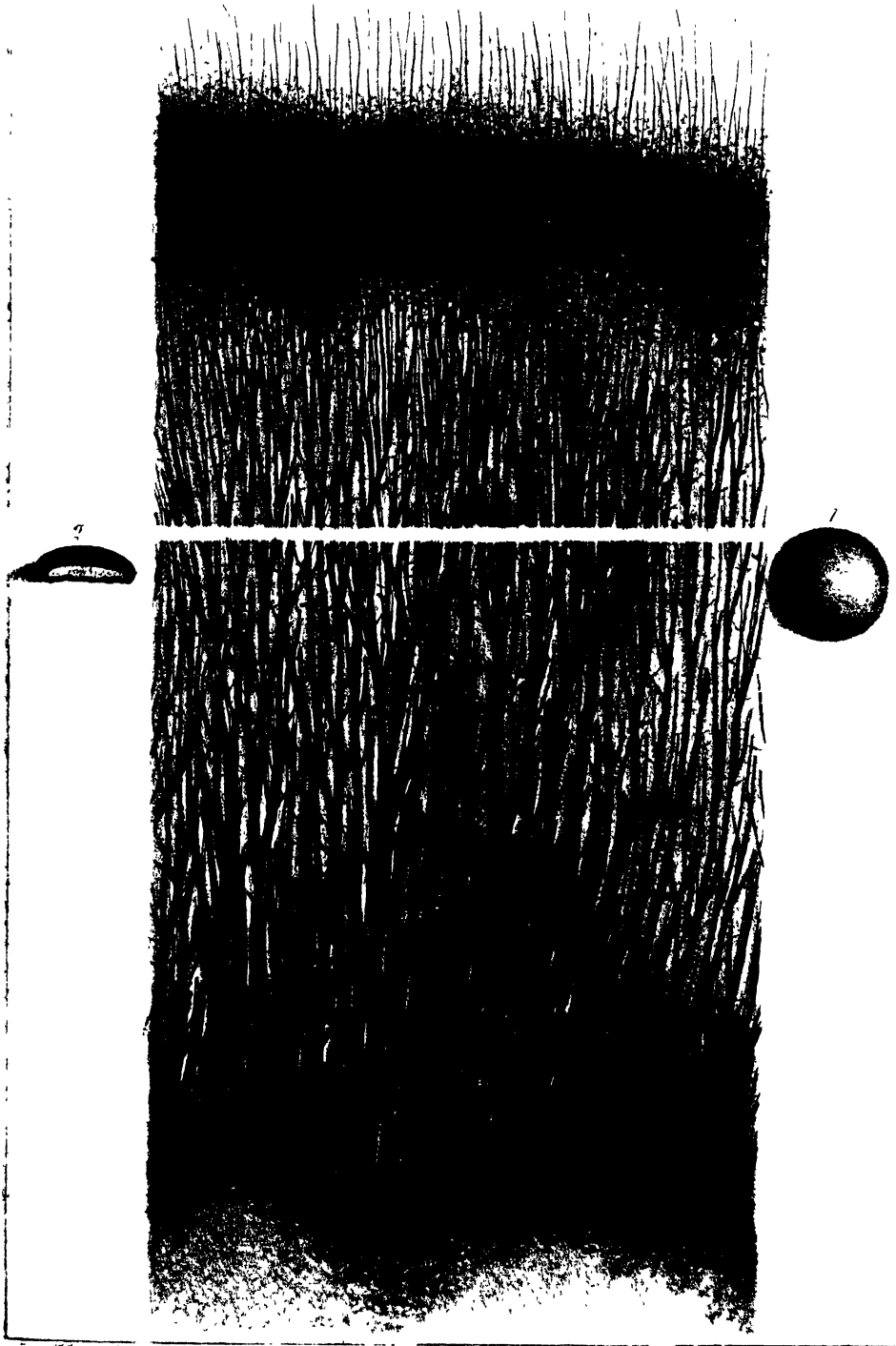
London Published by A. Baillière, 1840



Isaac Aldous and et sinc

Pub. by Black, Tilt & Hodgson

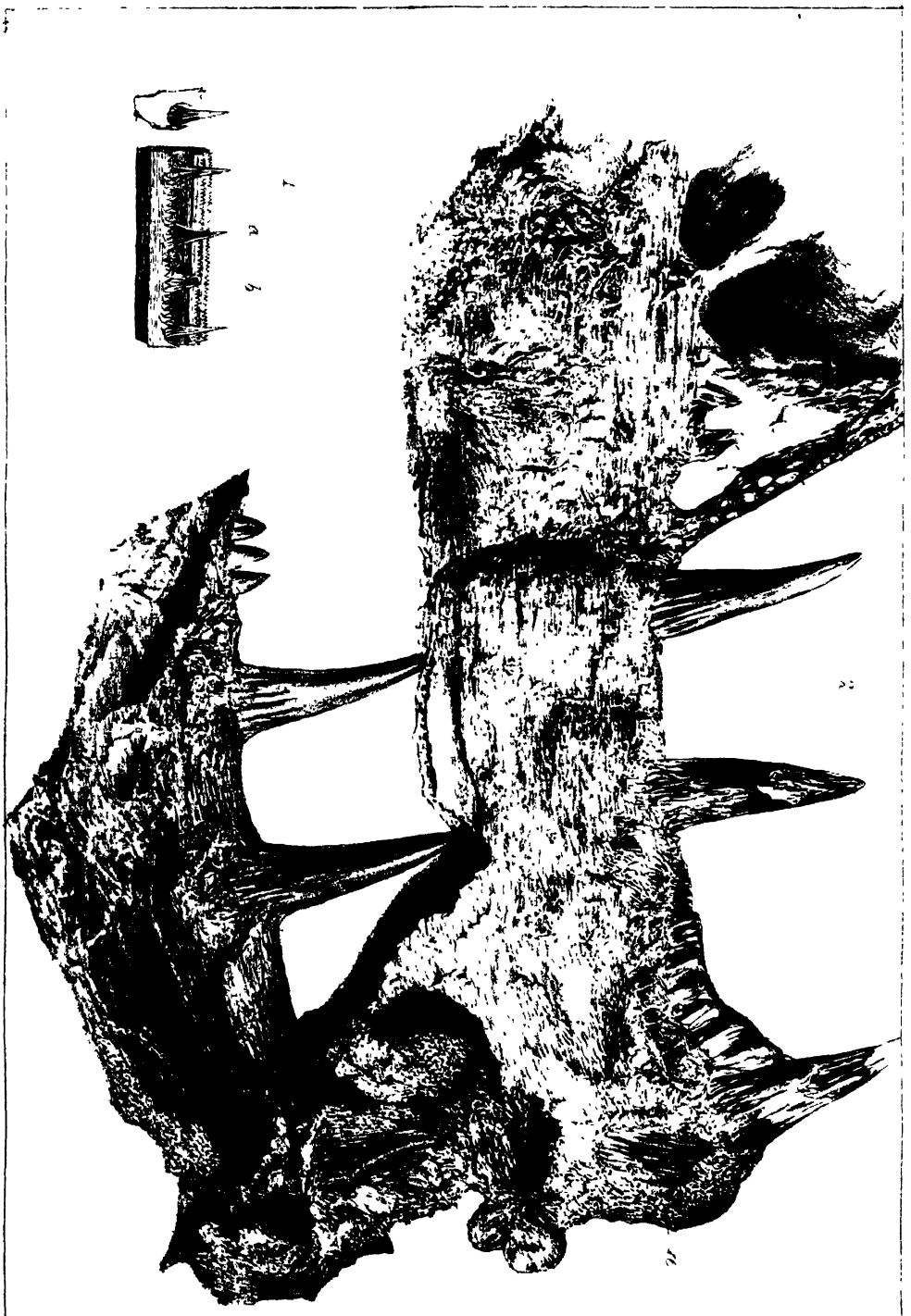
SEMIFOLIUS



SPHÆRODUS.



1 2 3 PYCNODUS. 4 8 GYRODUS


a
b



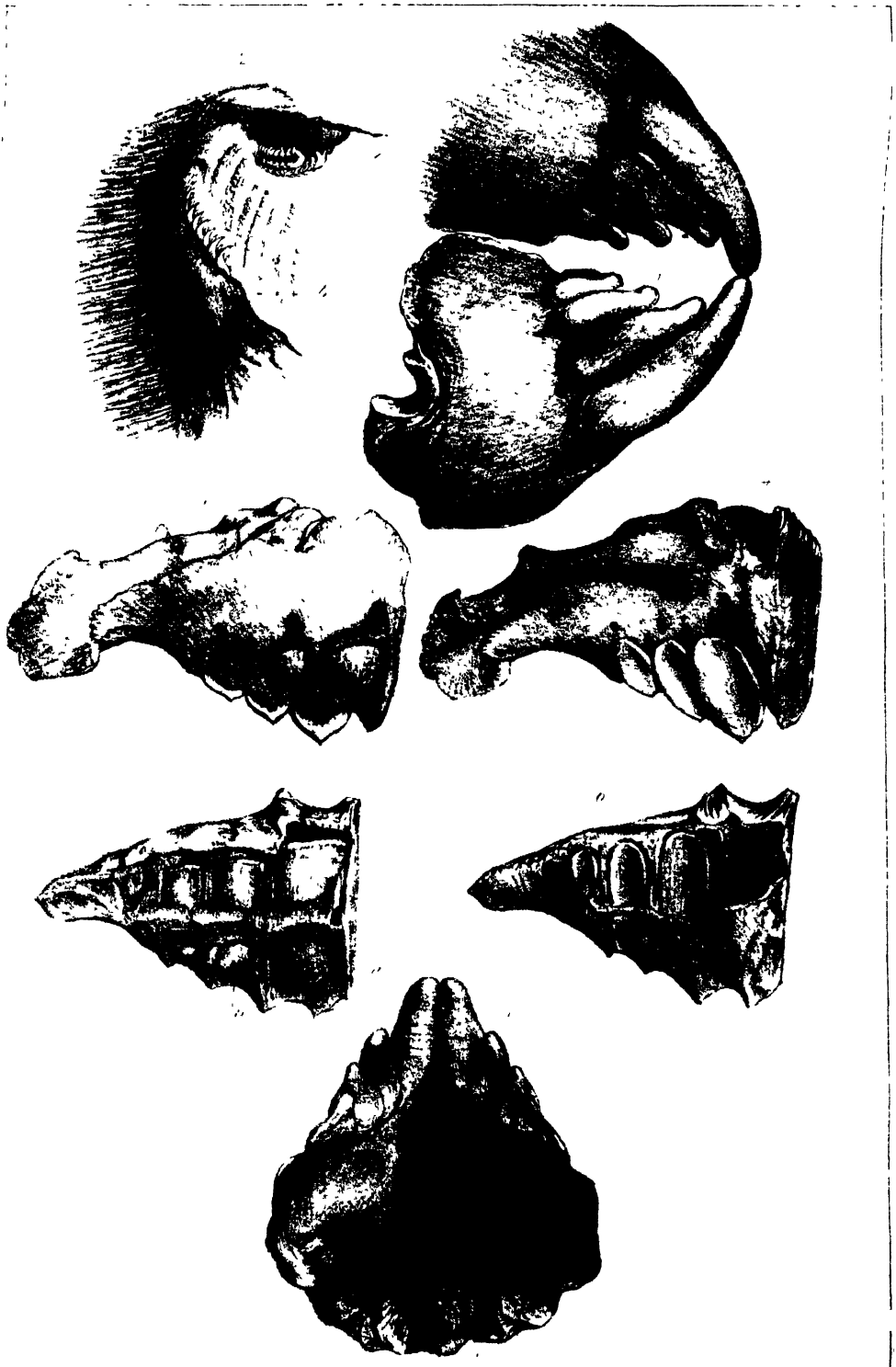
RHIZOPUS

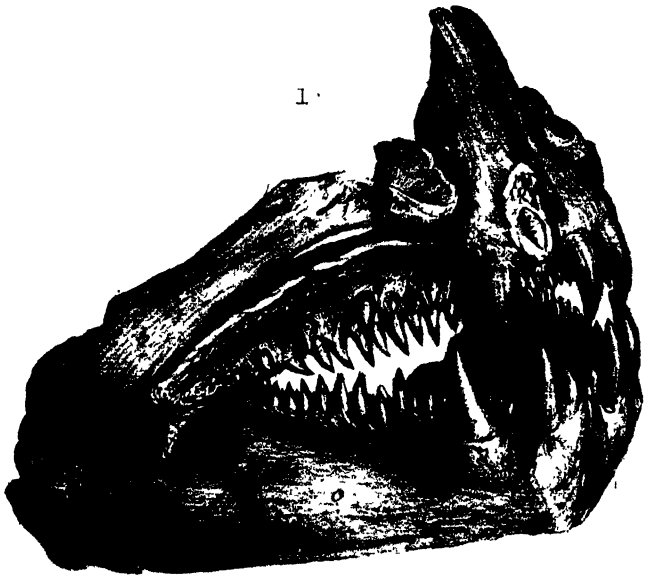



b
a
a
b
a



1 TETRODON. 2 DIODON





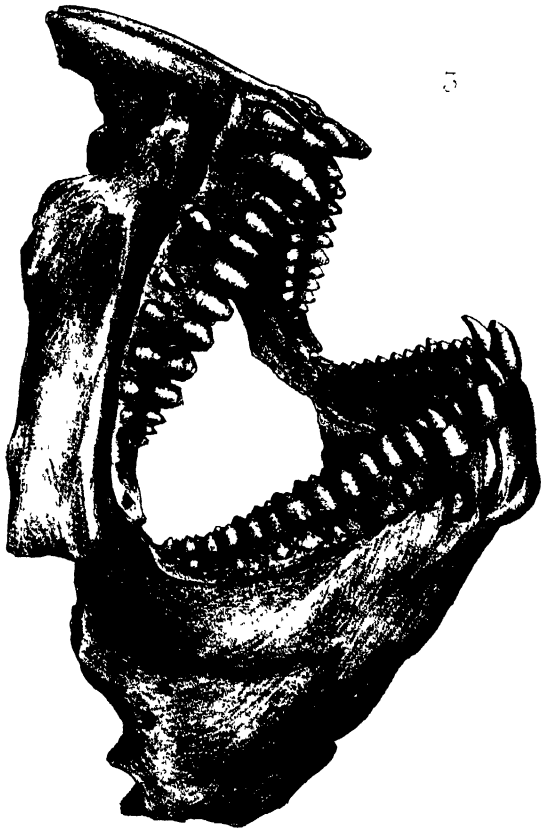


Ens. Adams, del. & Lith. Day & Hughes, Lith. to the Queen

DENTEX.

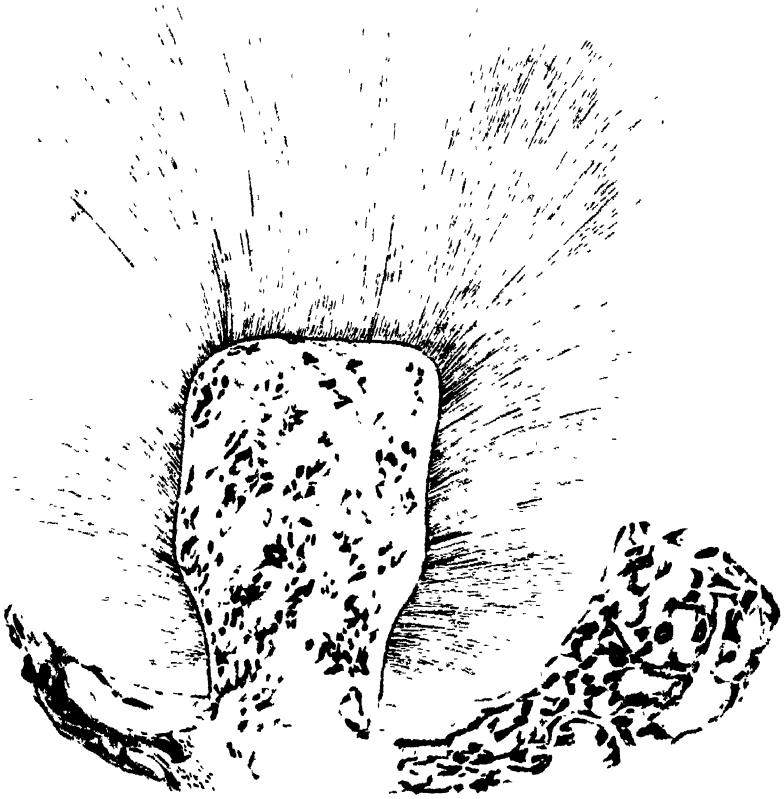


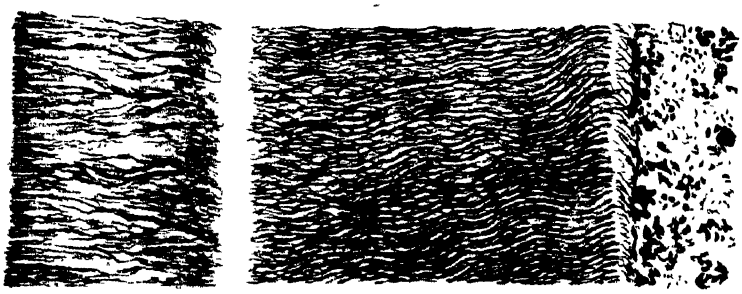


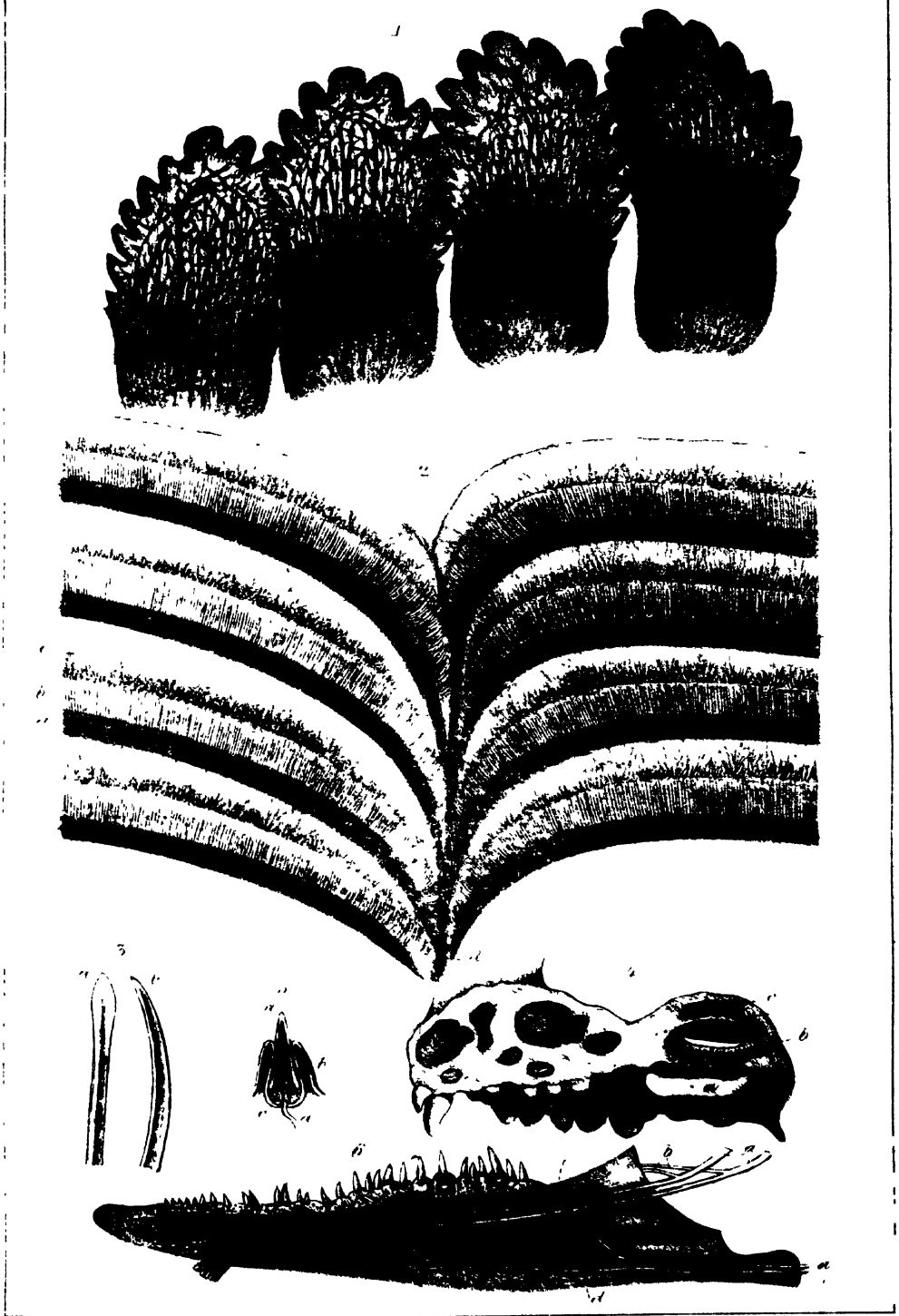


Day & Haghe Lith.rs to the Queen

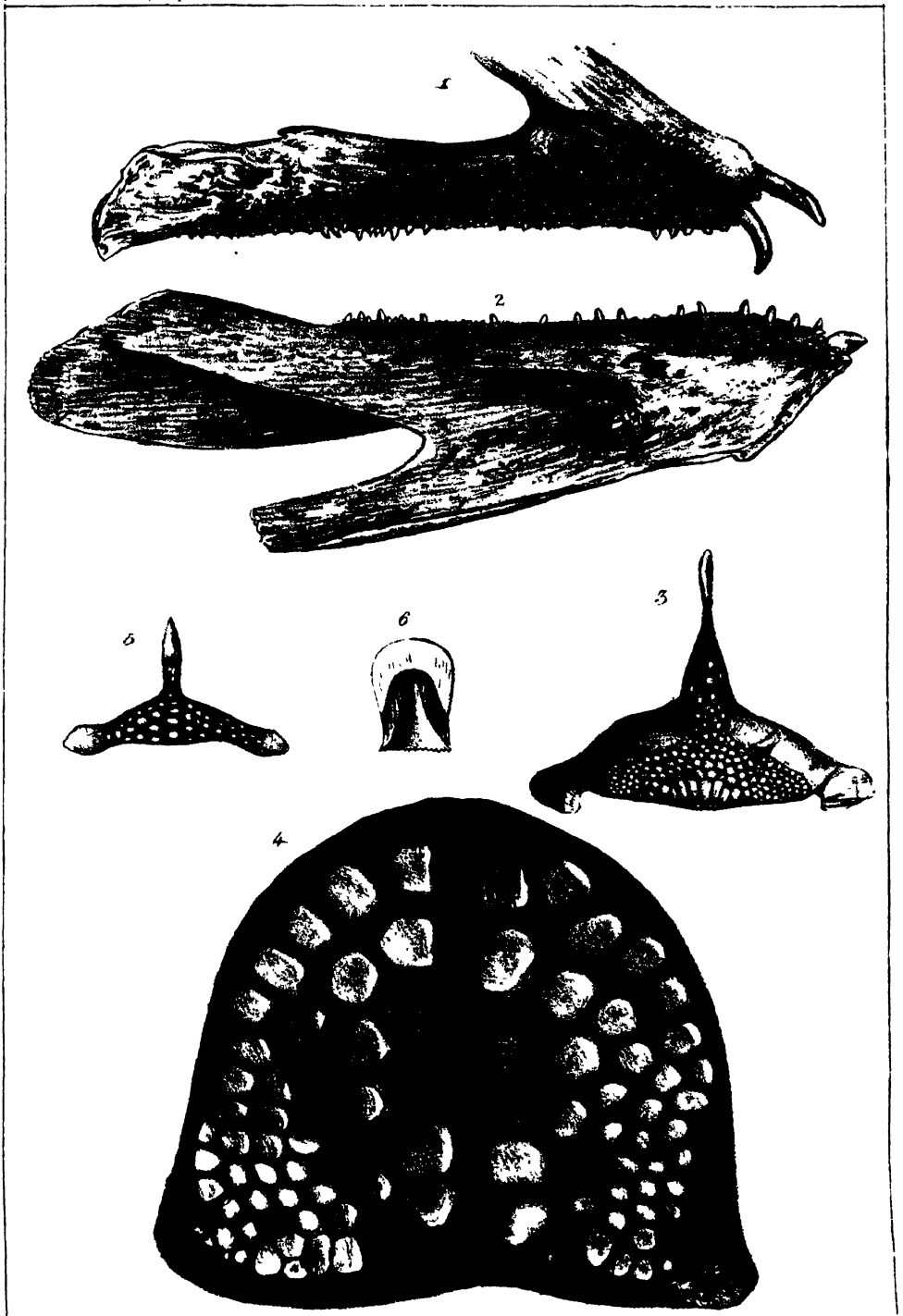
1 & 2 SARGUS — 3 CHRYSOPHRYS







1 ACANTHURUS 2 PHYLLOPUS



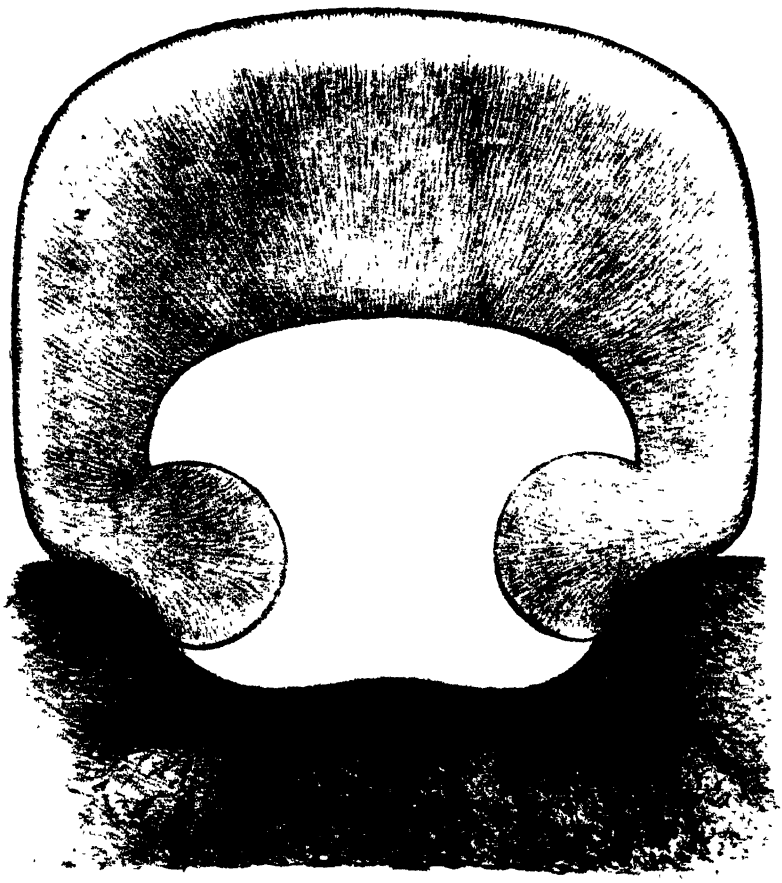
Vincent Brooks, del. et lith.

Day & Haghe, Lithrs to the Queen

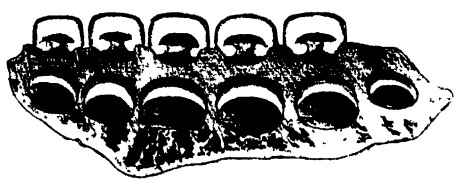
1. 4. LABRUS . 5 6 CHRYSOPHRYS

London, Published by R. Taylor, 1840

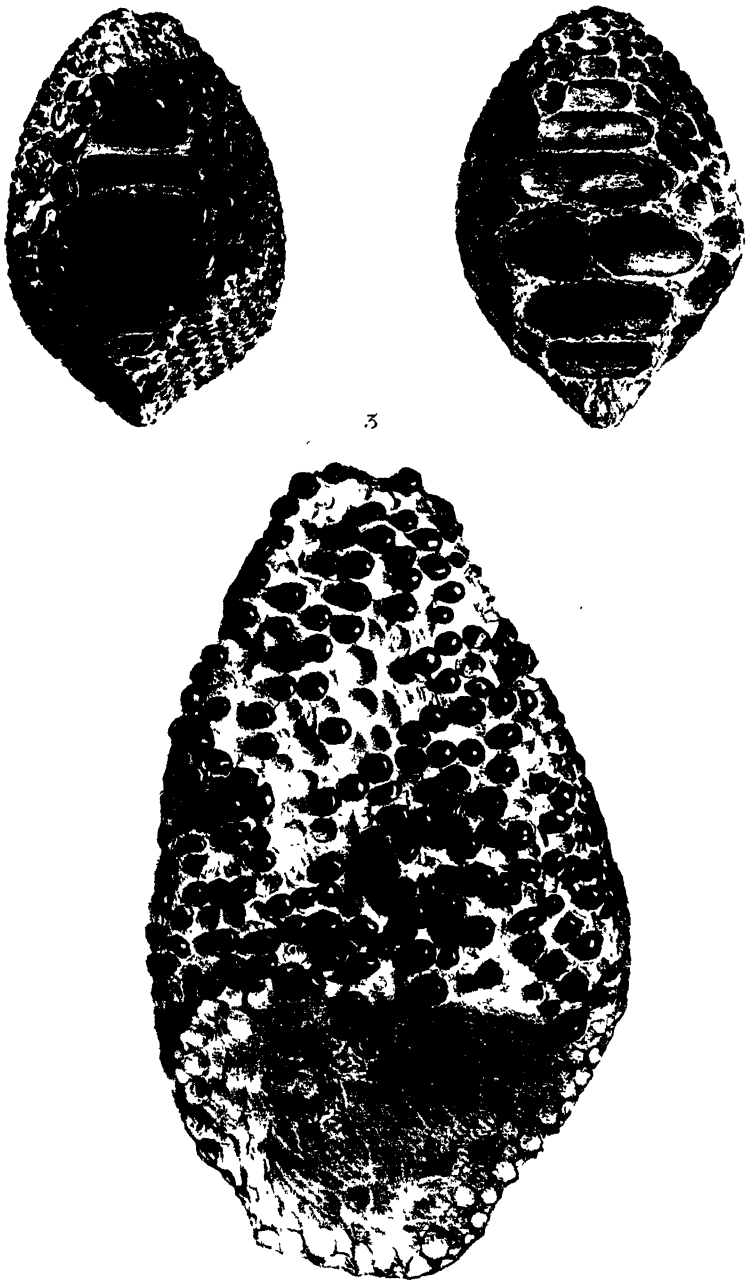
2



1



PHARYNGEAL TEETH LABRUS



LOWER PHARYNGEAL DENTAL PLATE
Fig 1 & 2 Phyllodus Fig 3 Tisodus



Isaac Alcock del et Sculp.

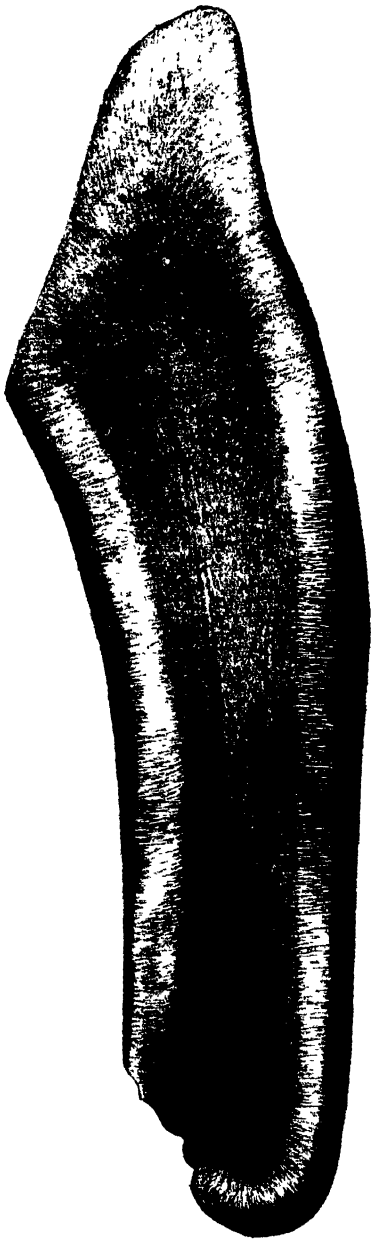
Drawn to Hatchlith & with the Camera

1 & GONIODONTS.—4 10 HALECOID



SCARUS

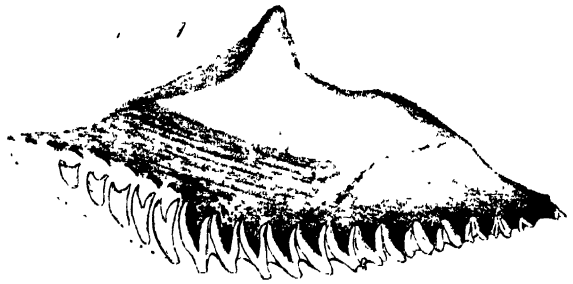
London Published by H. Baillière 1840

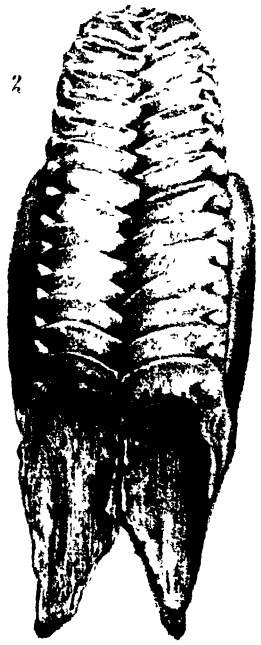


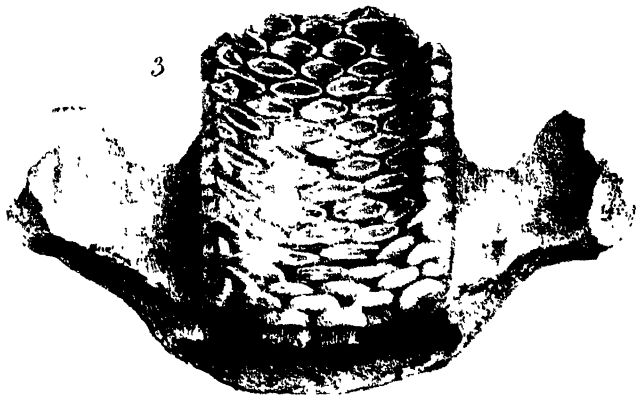
Lens. Adams, del. et lith.

Day & Haghe, Lith.rs to the Queen

MAXILLARY DENTICLE SCARUS



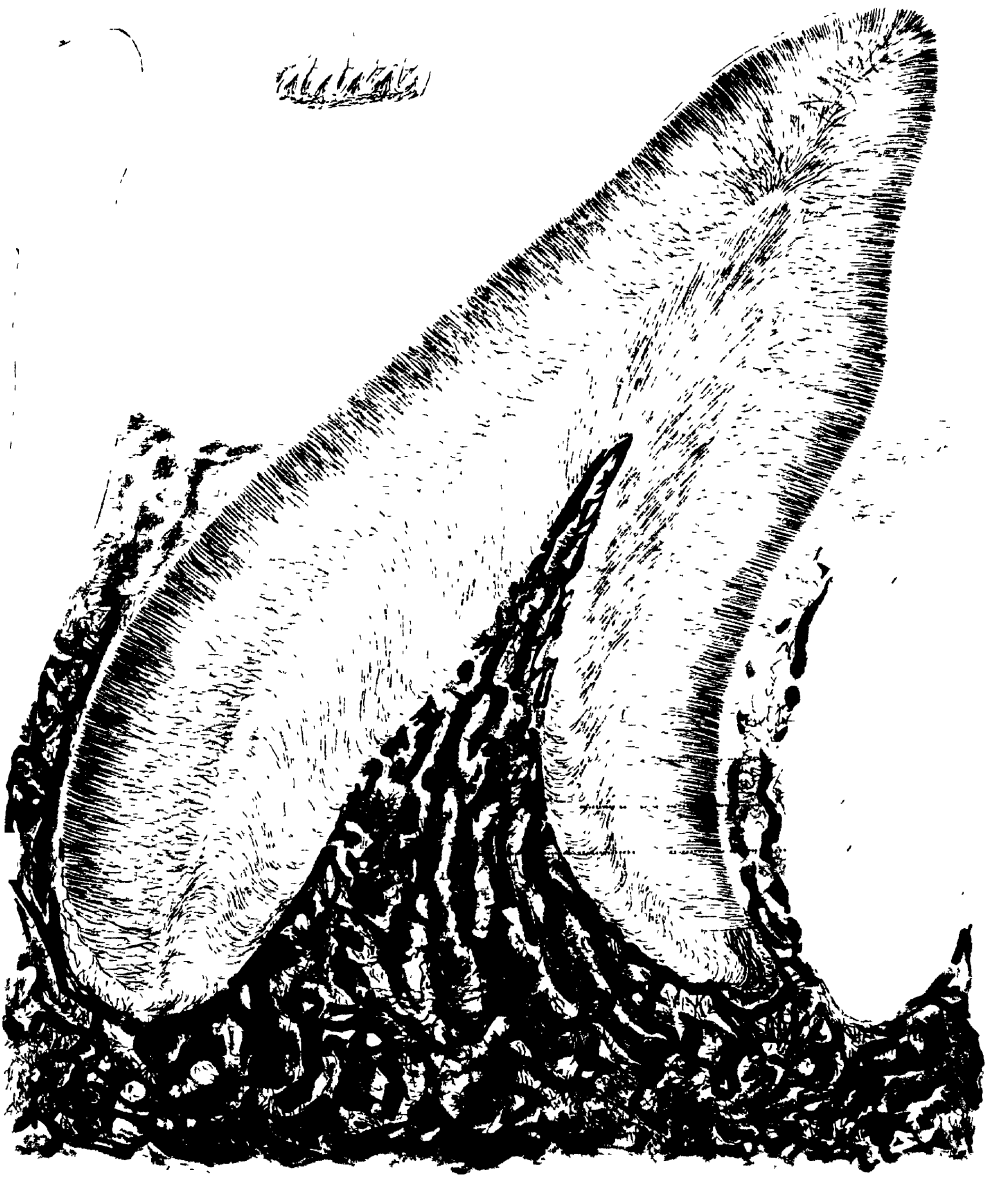




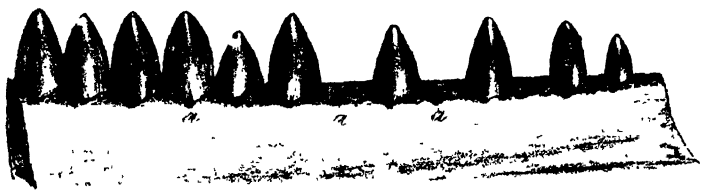
To. S. Aldous, del. et lith.

Day & Haghe, Lith.rs to the Queen.

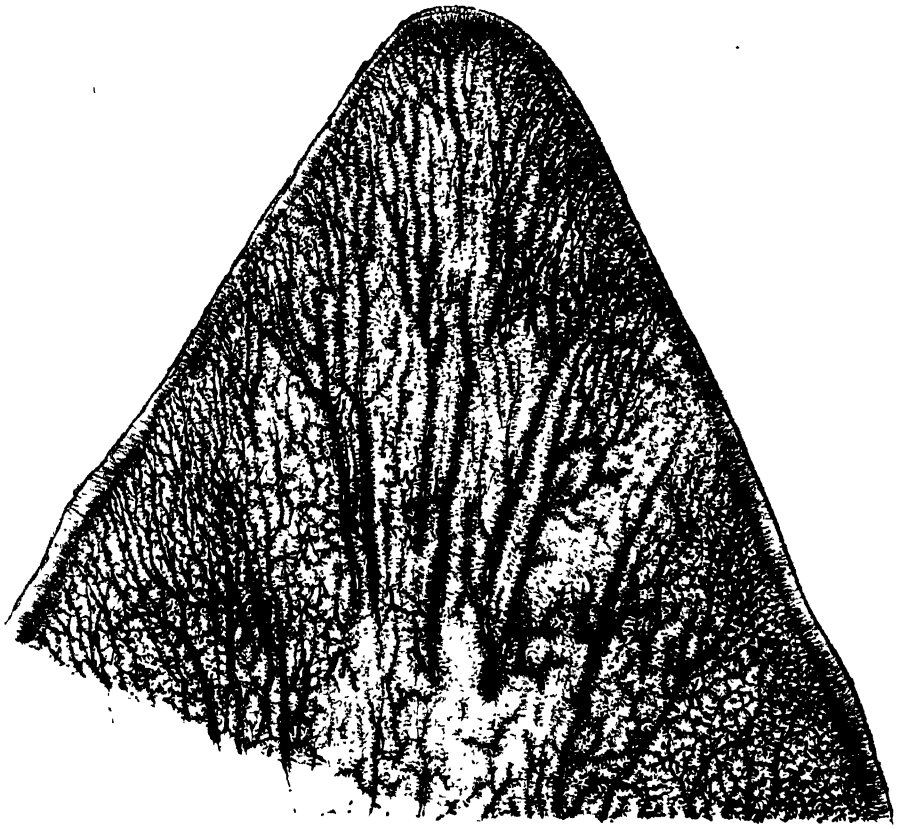
PHARYNGEAL TEETH, SCARUS



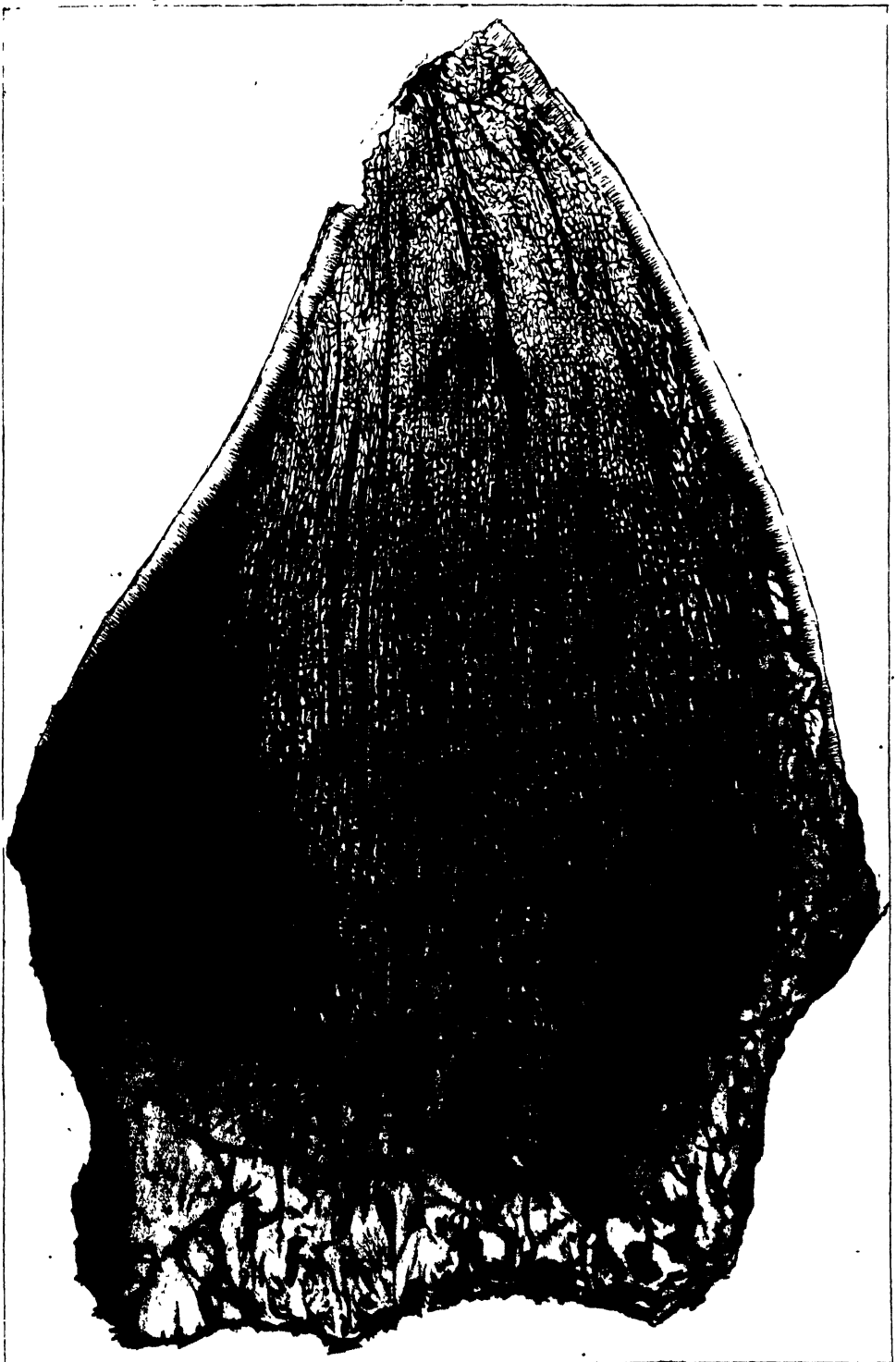
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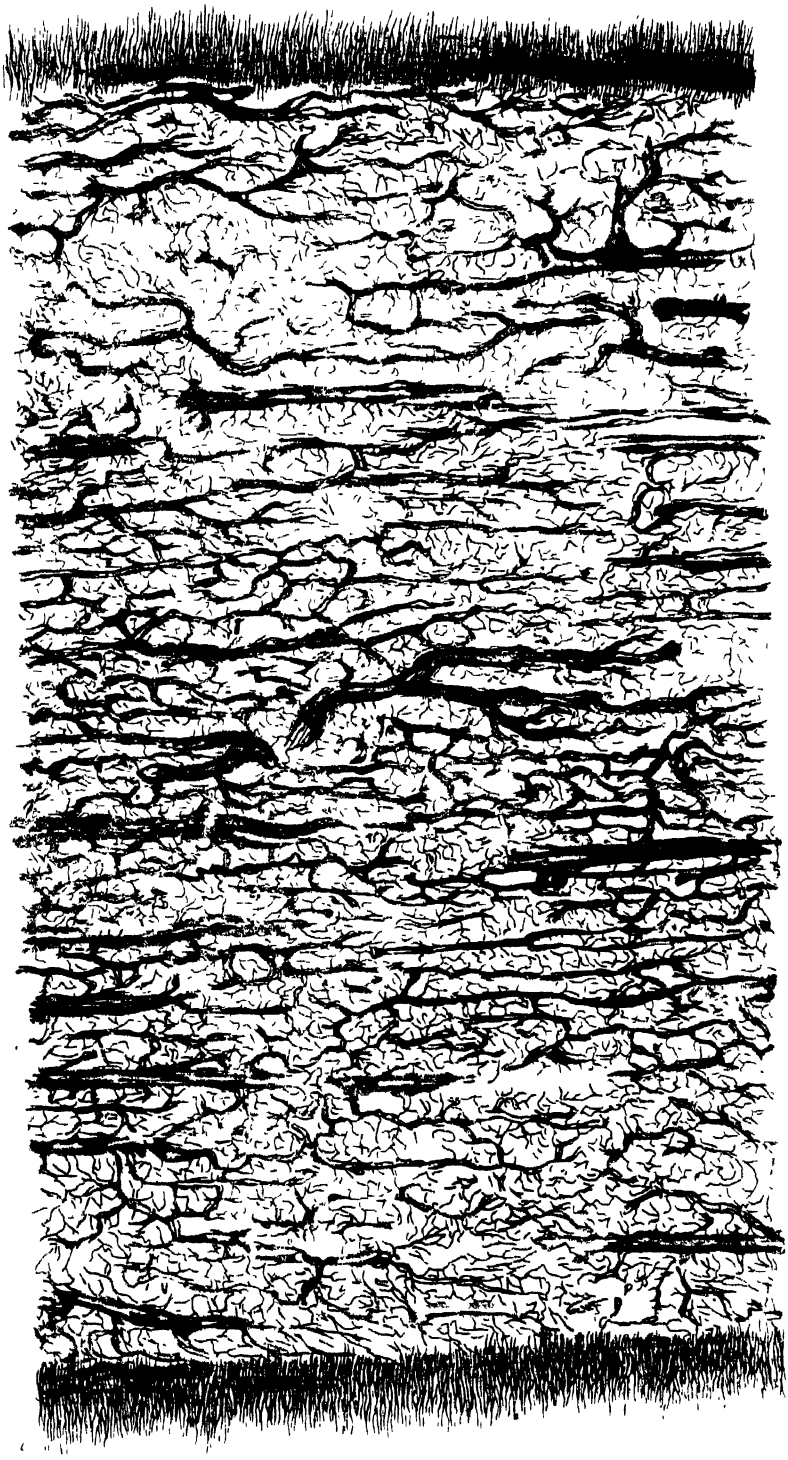
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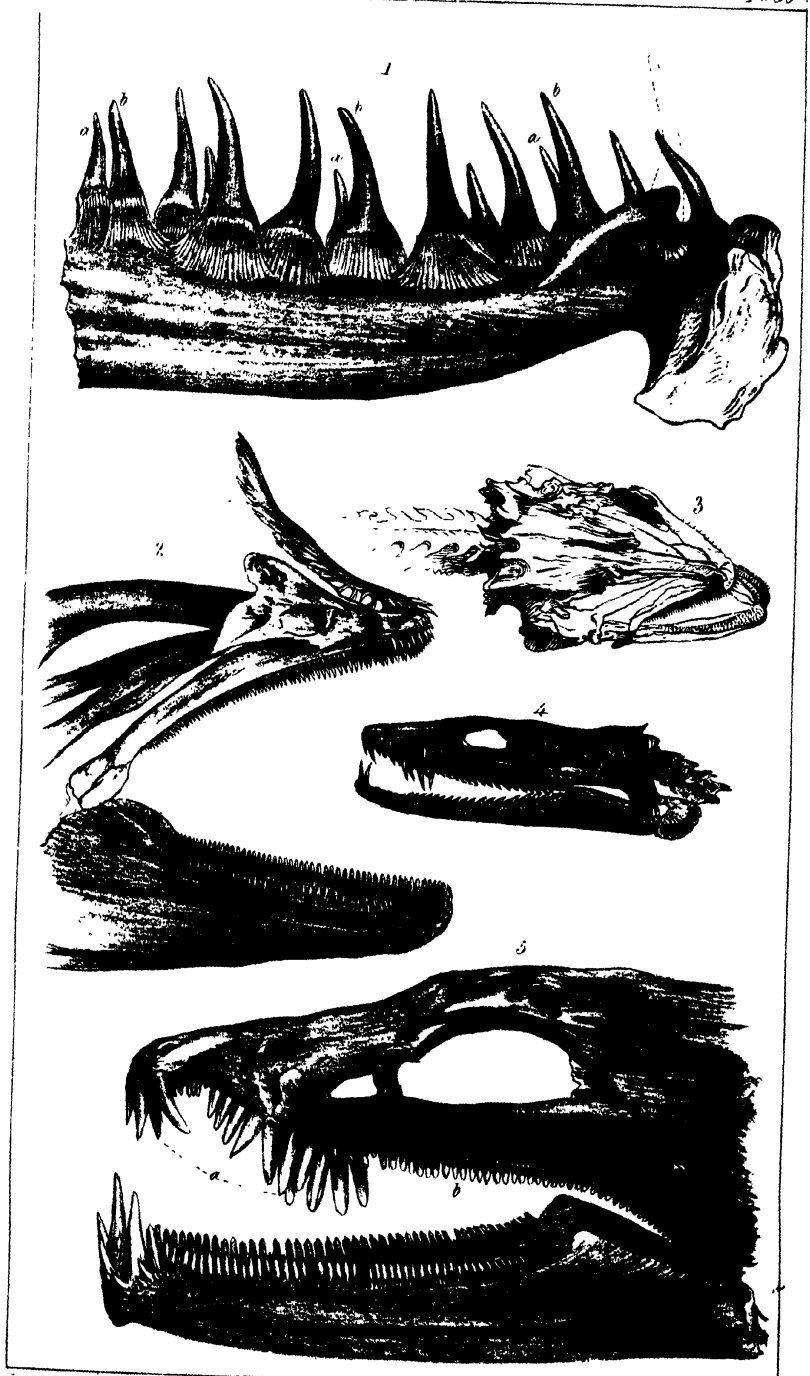


SPHYRENA



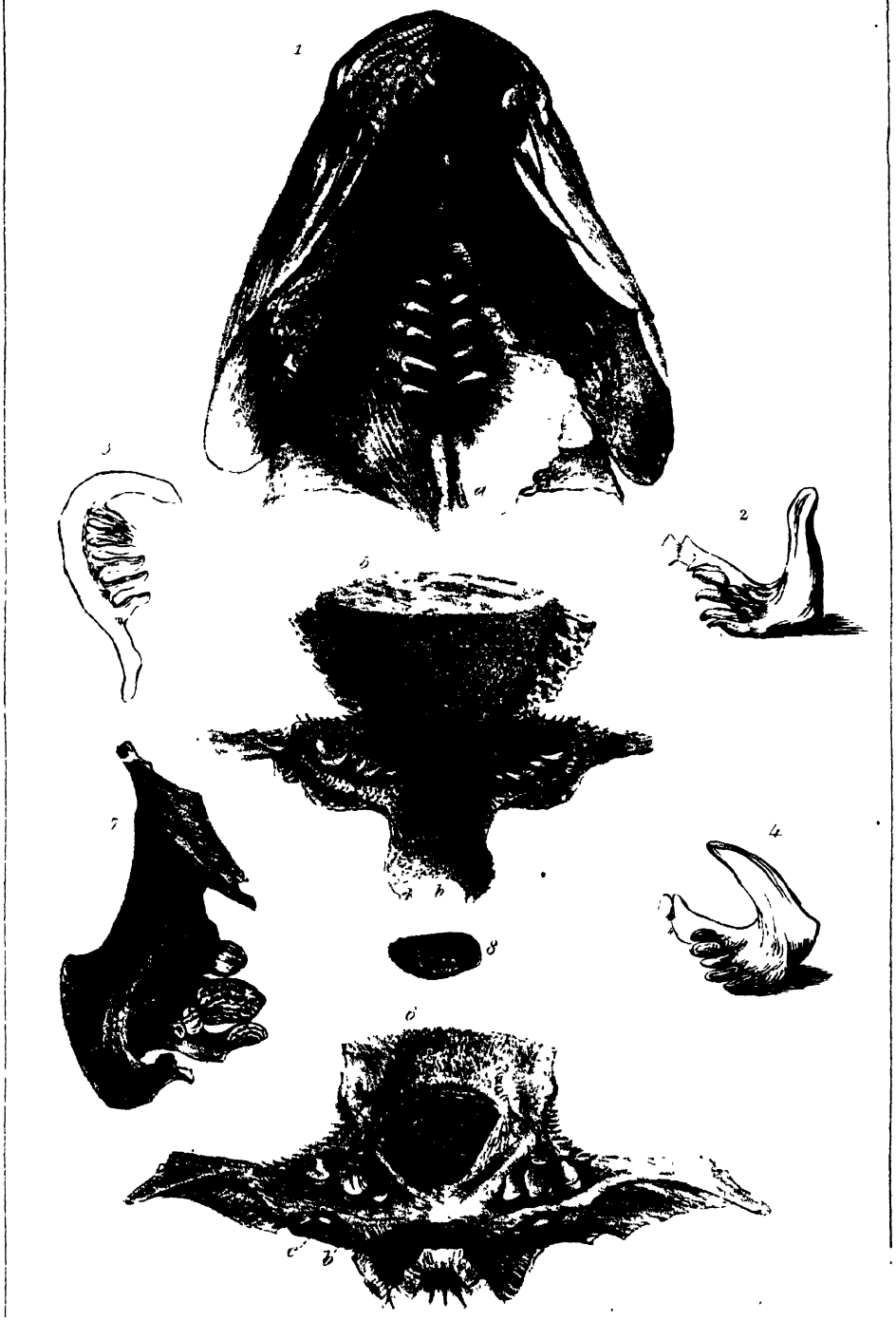
DICTYODUS





Geo. Scharf, del. & Lith.
Day & Haghe Lith.rs to the Queen

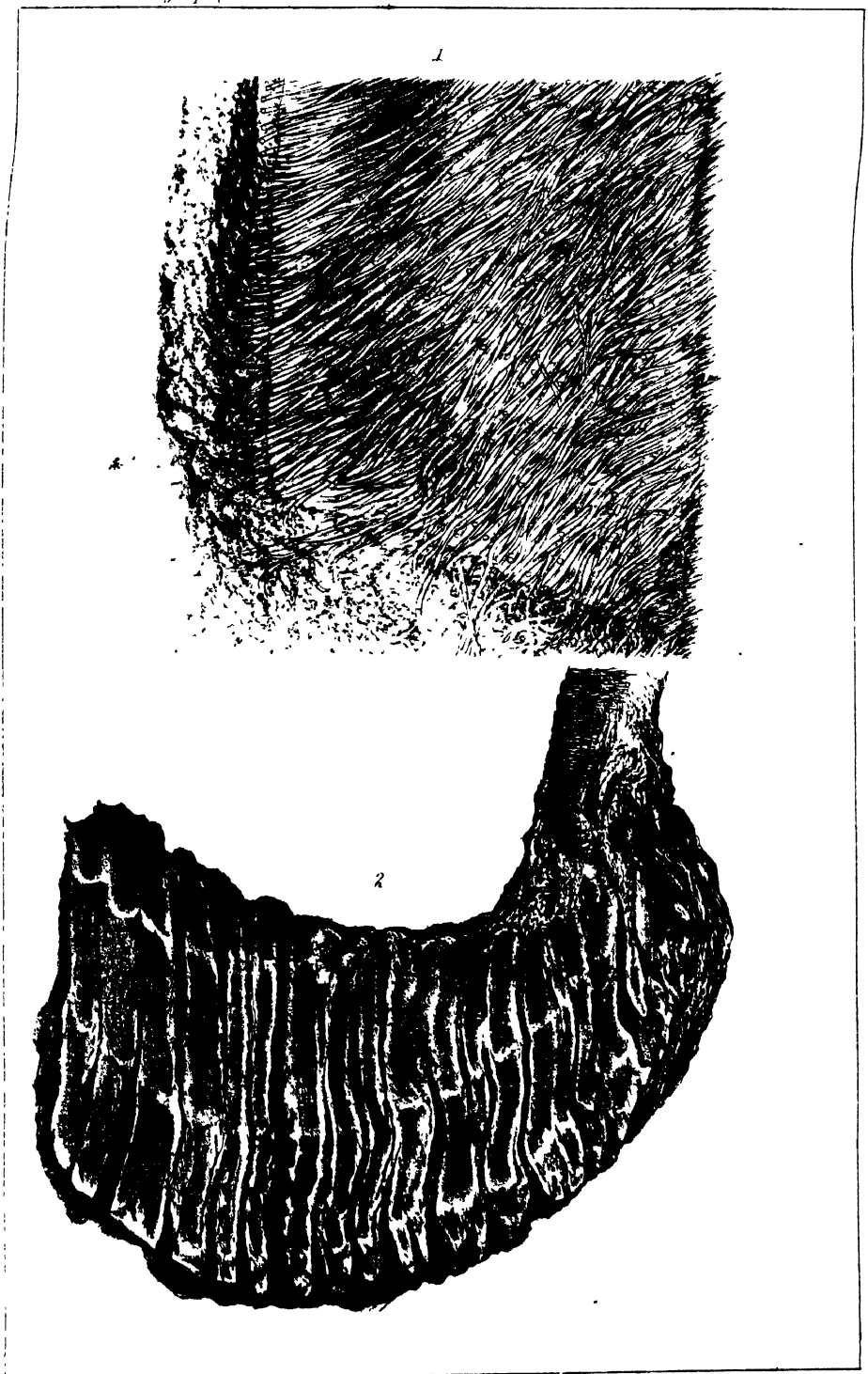
LOPHIUS 2 & MURÆNOIDS



W. West Ath. ad. Del. et Lith. London
Day & Haghe Lith.rs to the Queen

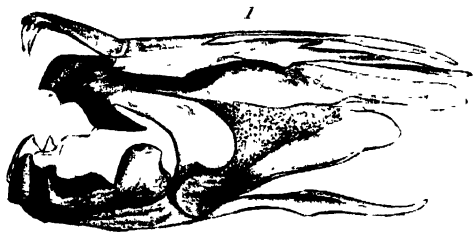
CYPRINOIDS

Published by Taylor & Walton, London, 1841



BARBUS.









Louis Agassiz, del et lith

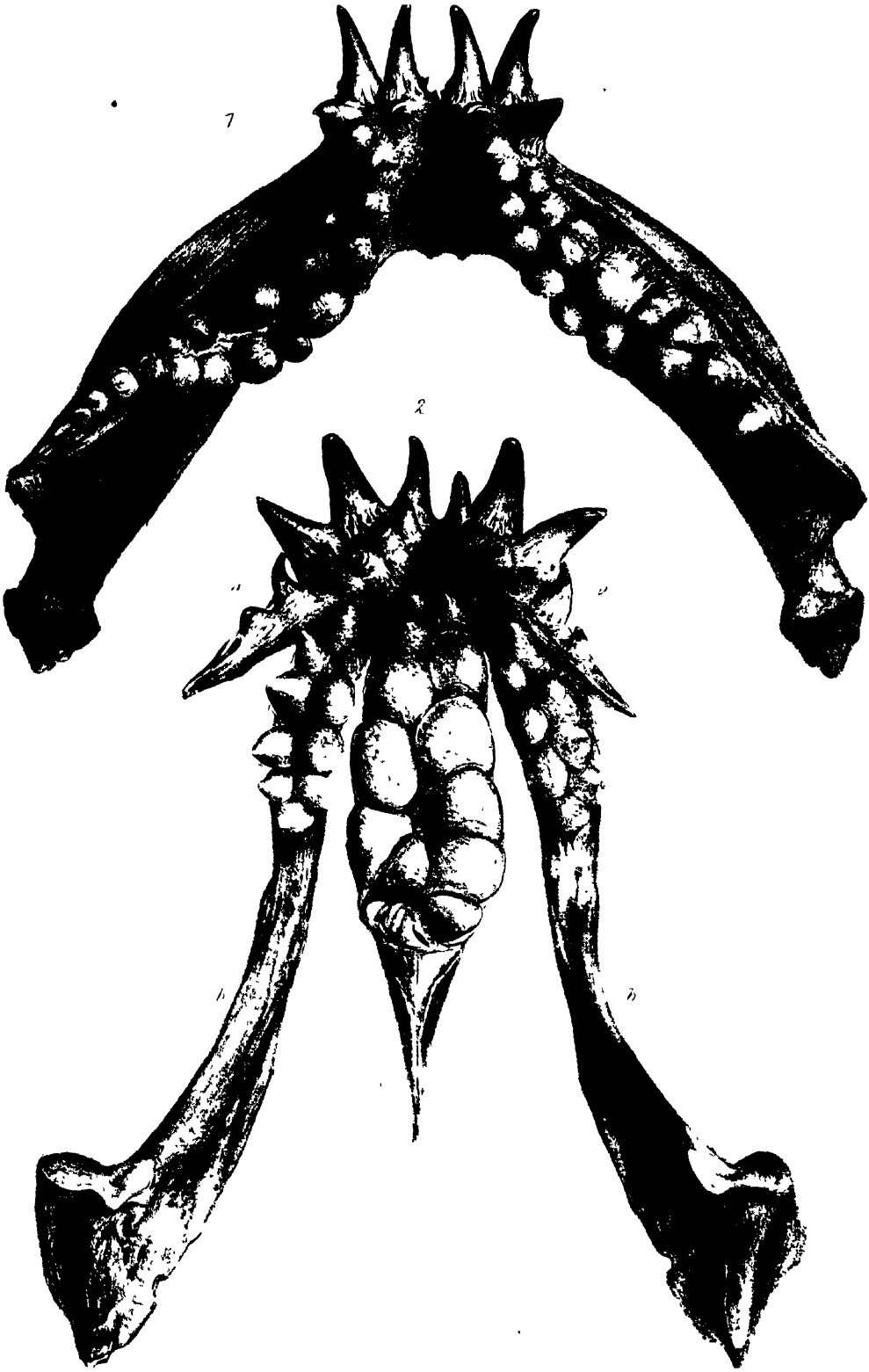
Day & Haghe, Lith. to the Queen

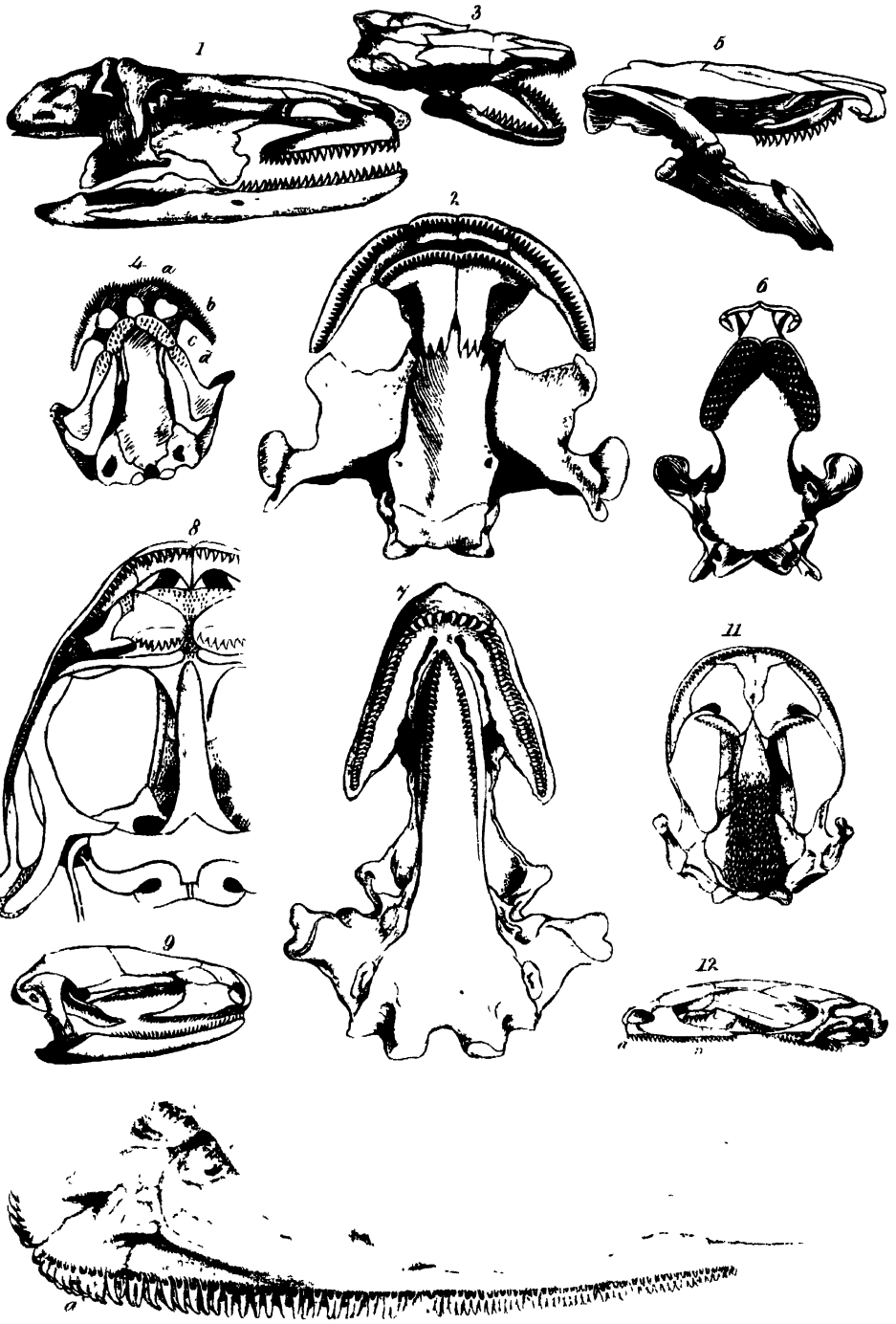
LEPIDOSIREN



Tom. Bidault del. et sculp. Dup. de Tours et Jacotin lith. de Lemercier

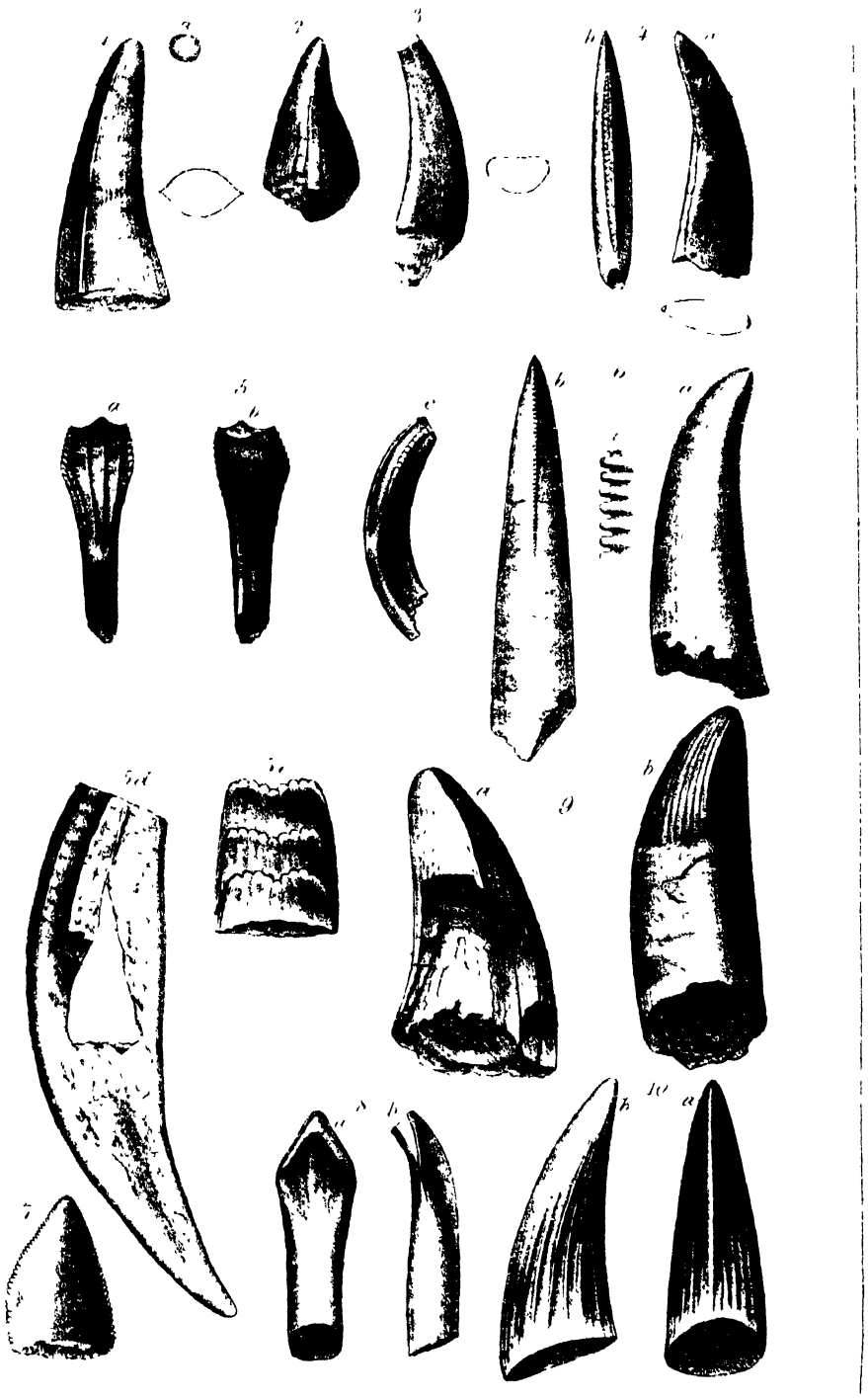
ANAKEITCHAS


1
2
a
b
b
b



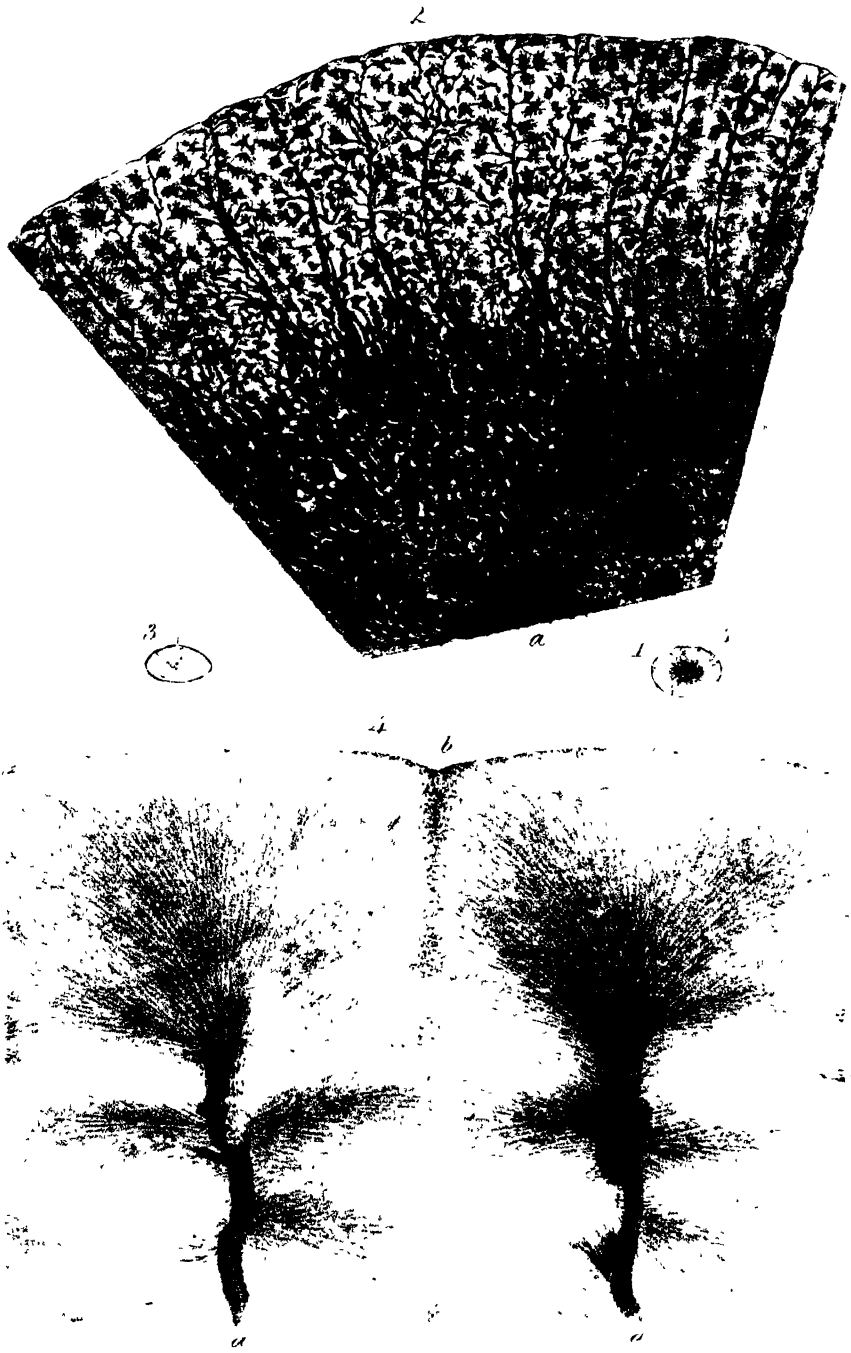
Lens Aldous del. et Lith. Lavt. Hagreaves to the Govt.

BATRACHIANS

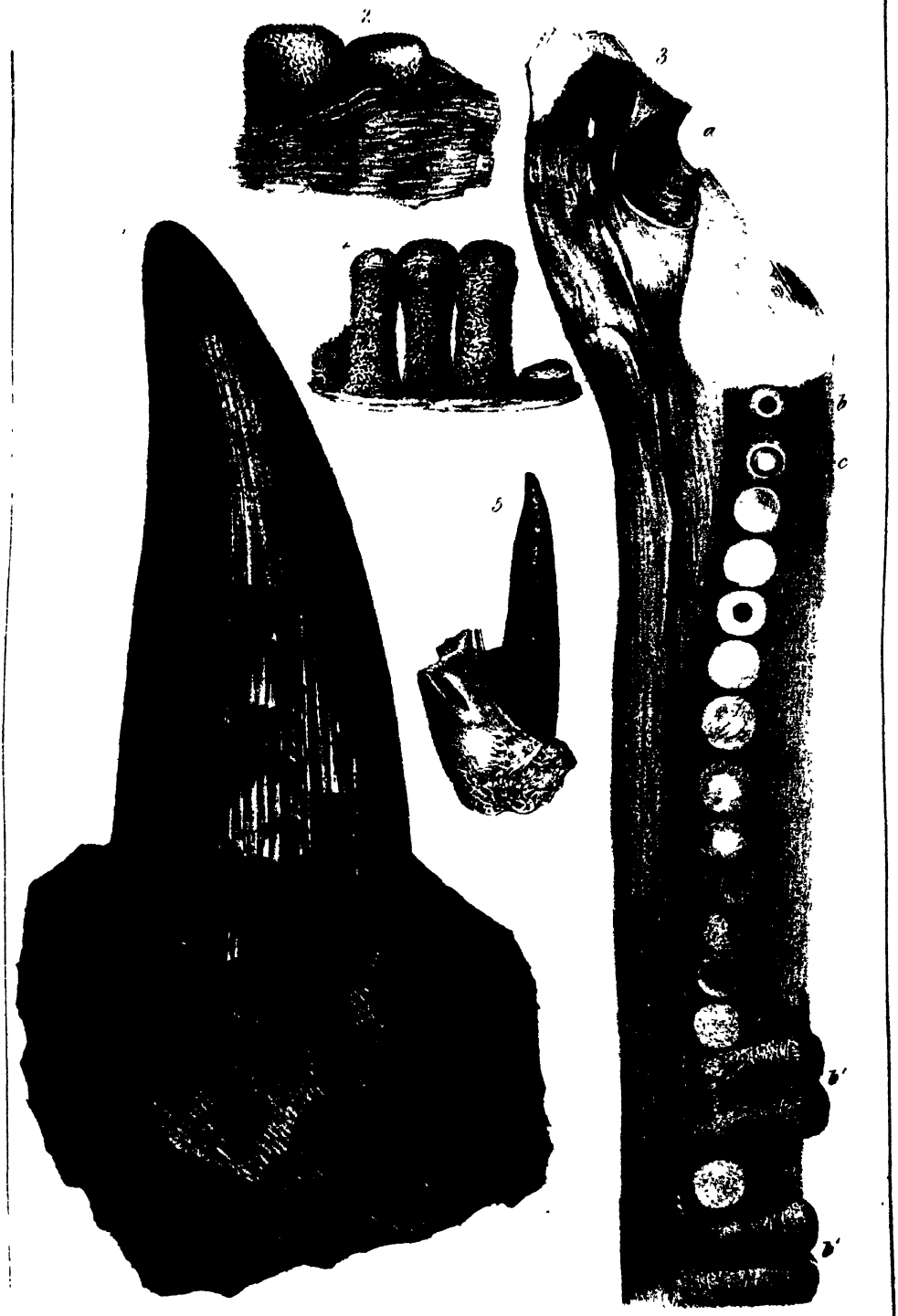


Geo. Sowerby del et lith. Day & Haghe Lith.rs to the Queen

VARIOUS FORMS OF TEETH IN EXTINCT REPTILES



DENTROTUS BIPORCATUS



1 LABYRINTHODON. 2 4 PHYTOSAURUS



Day & Hughes Lith.rs to the Queen

BYRRHODON. Pls 6 & 7 PTERODACTYLE

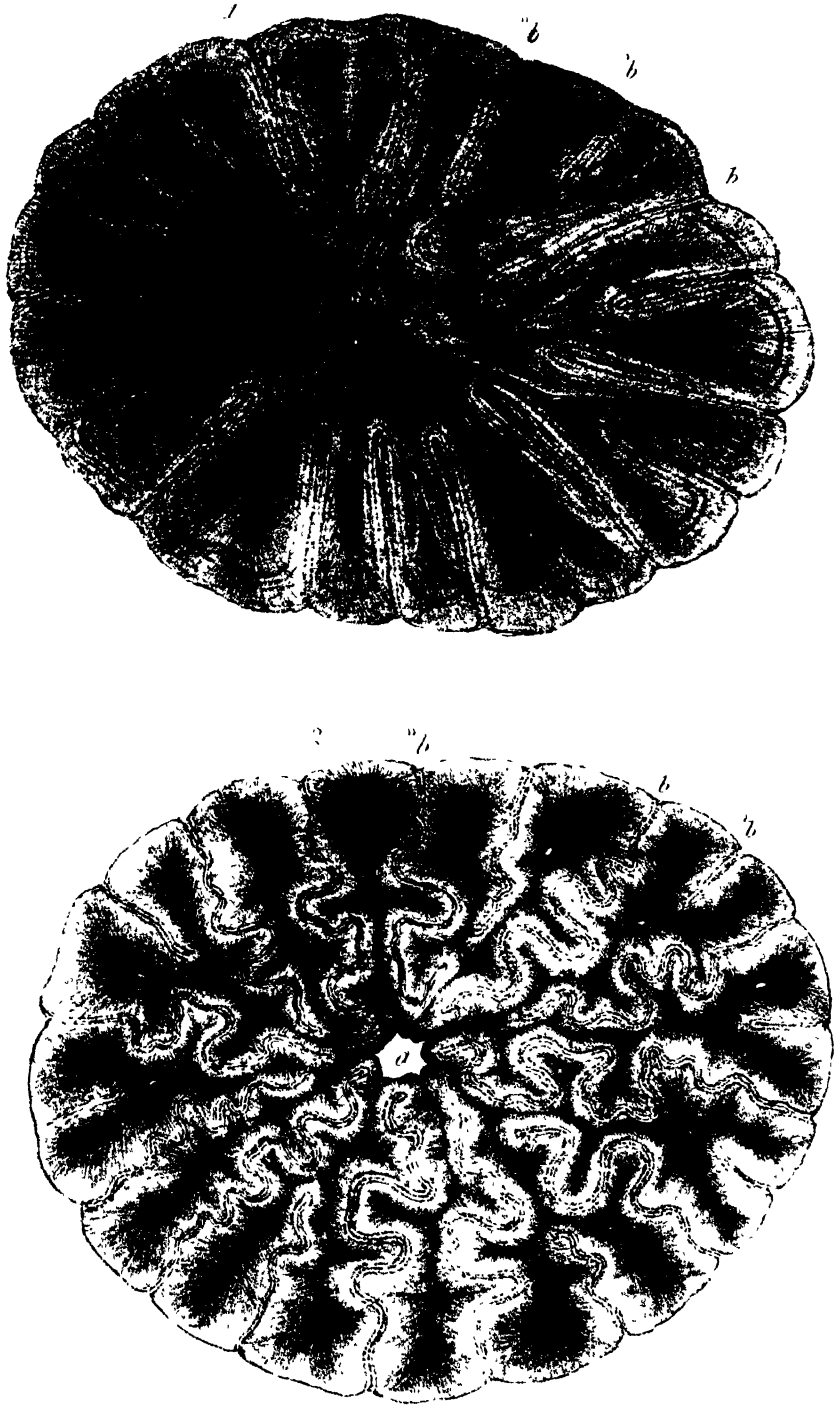
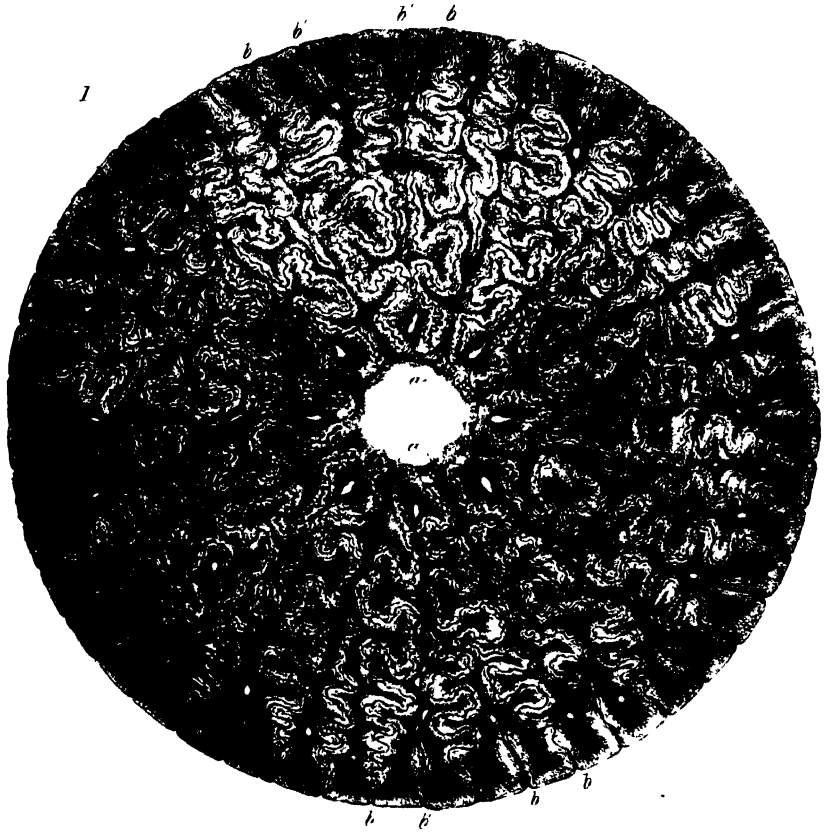


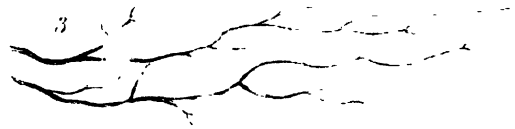
PLANCHE 1. — HOMOLEPTOGNATHUS



Lears Aldinus del et lith

MASTODONSAURUS

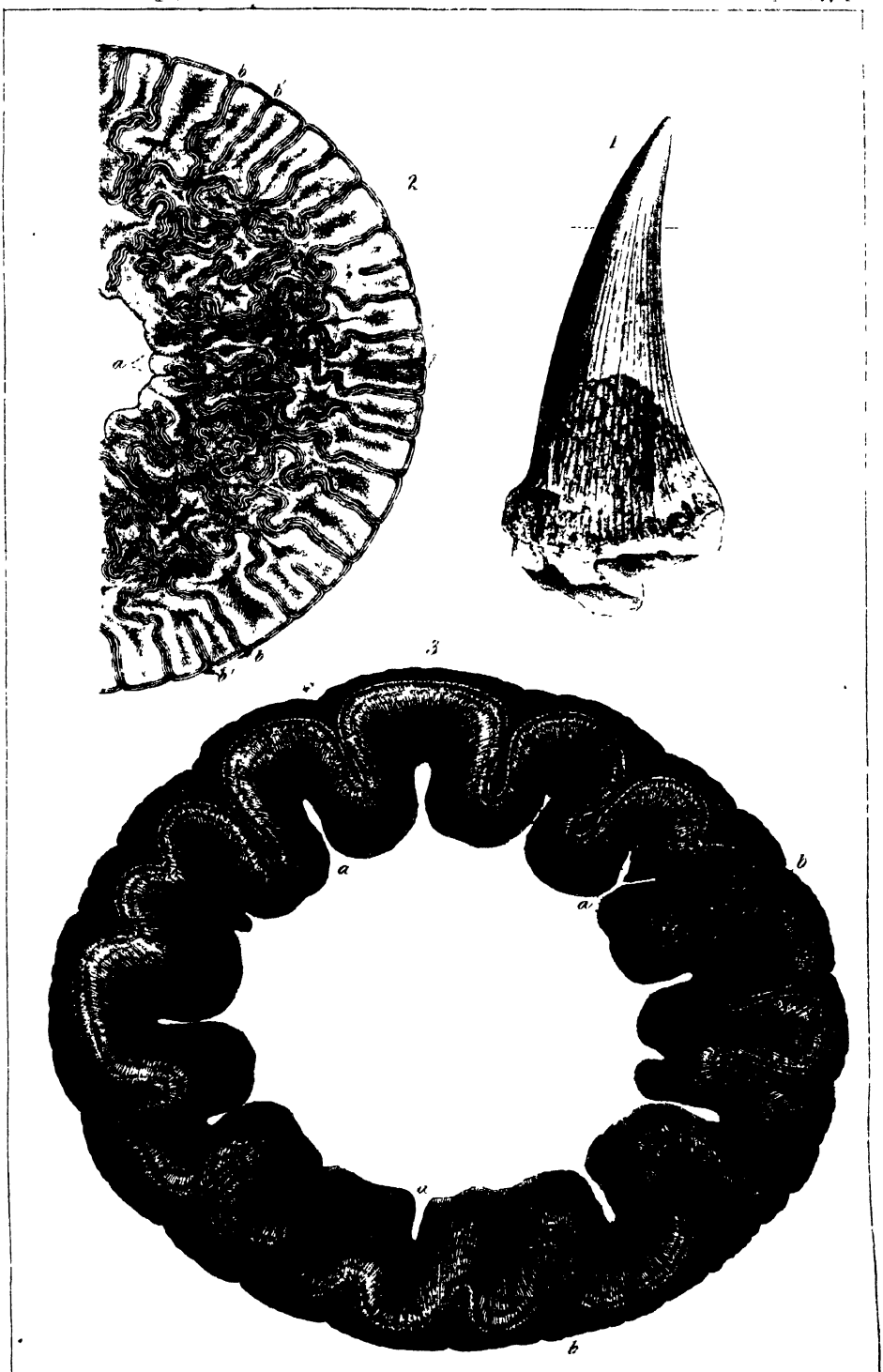






Lens Aldous, del et lithe

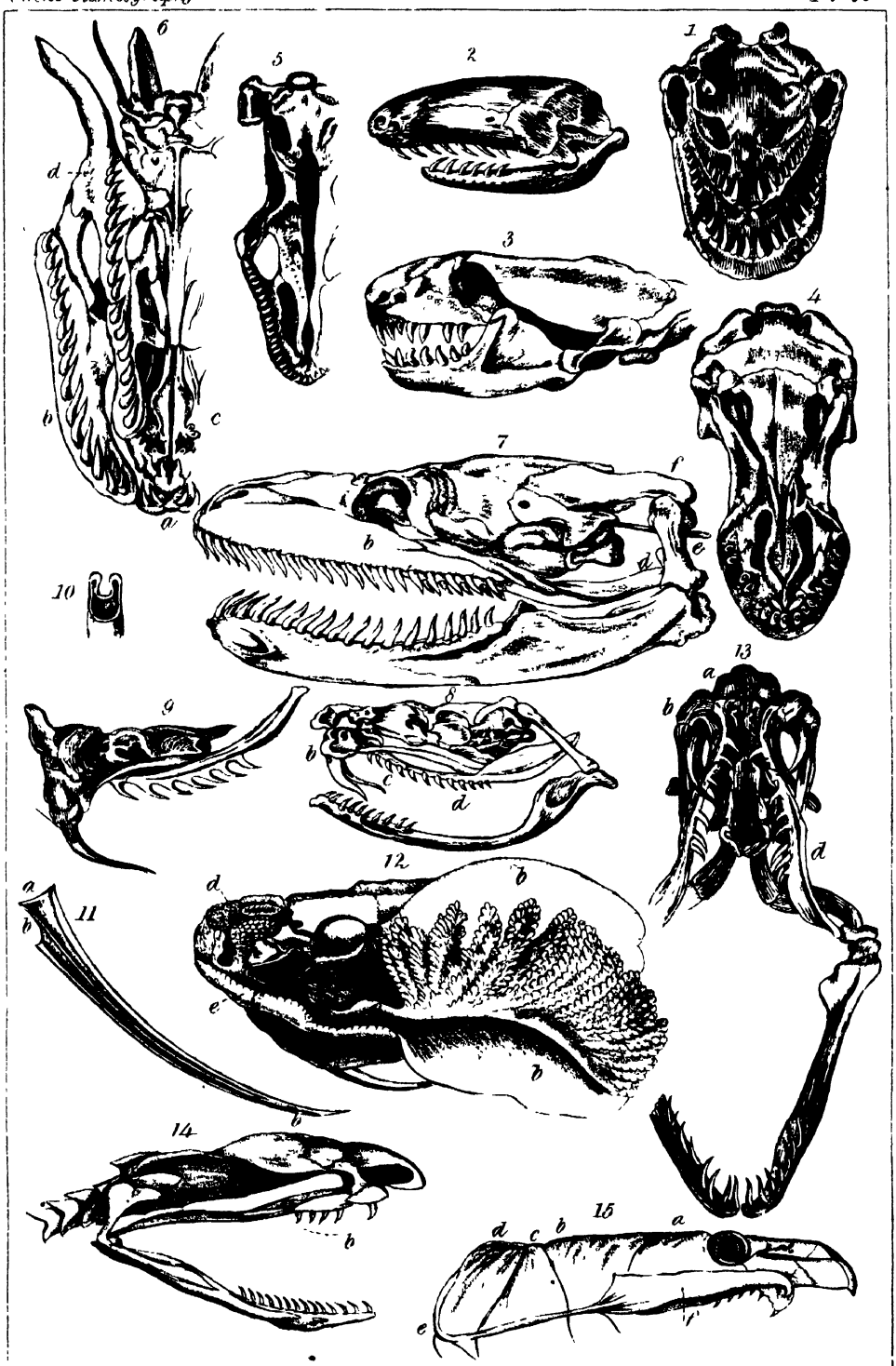
Day & Haghe, Lith.rs to the Queen



Lowes Aldous del et lithe

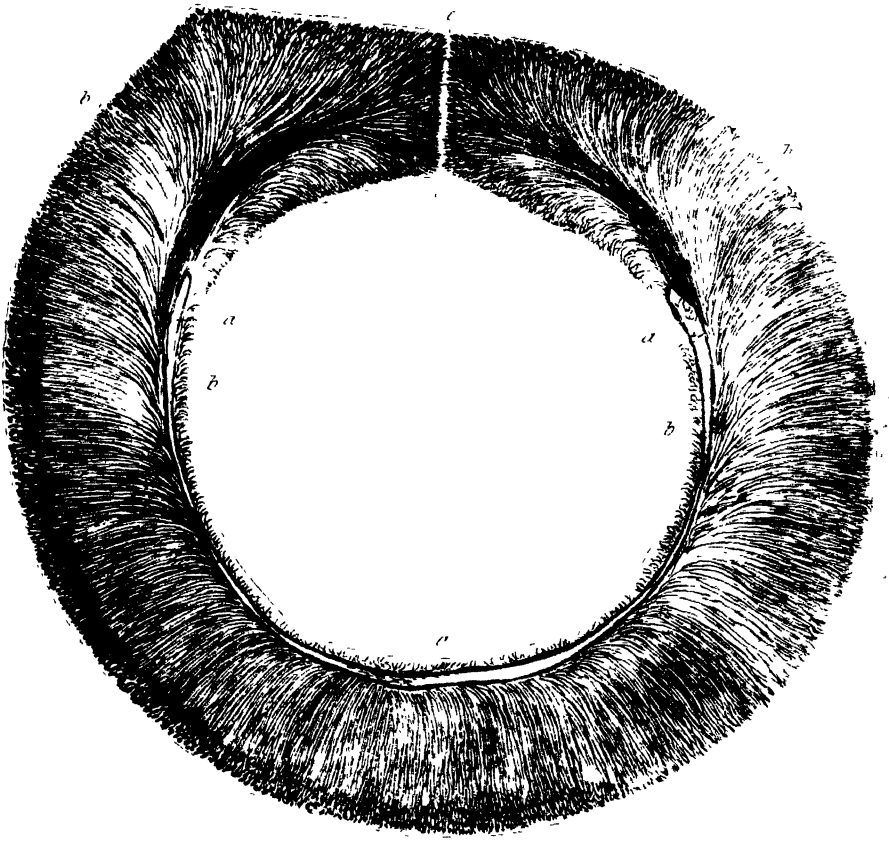
Day & Haghe Lith^rs to the Queen

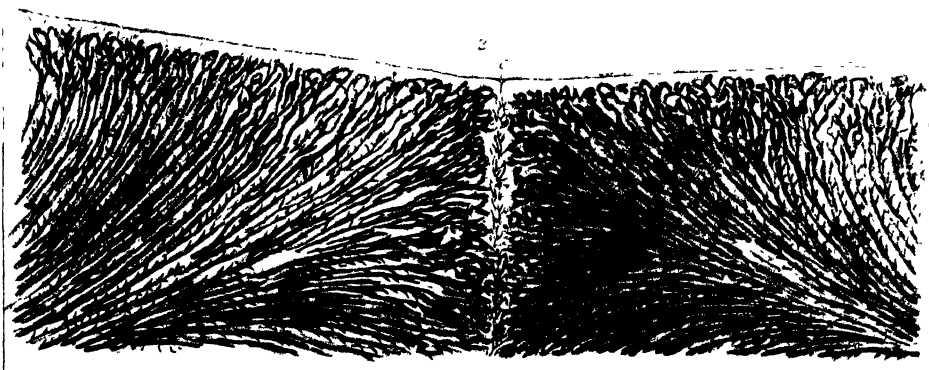
1&2 LABYRINTHODON . 3 ICHTHYOSAURUS



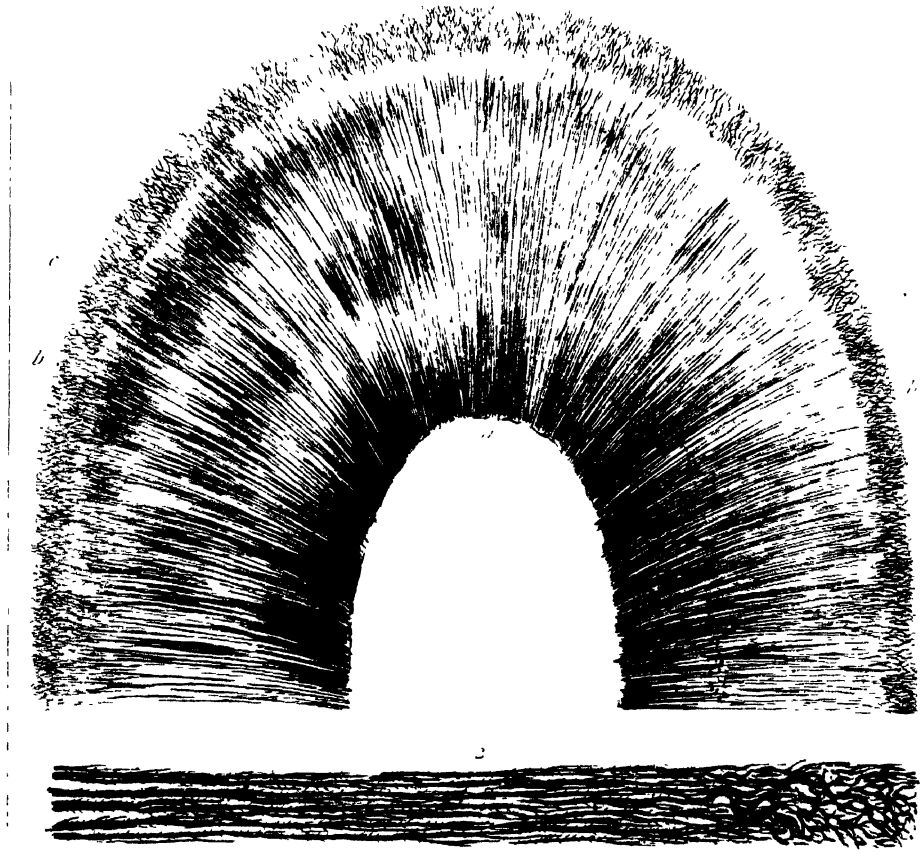
J.E.s Andrews del et lith. Day & Haghe Lith.rs to the Queen

OPHIDIANS





A POISON-FANG

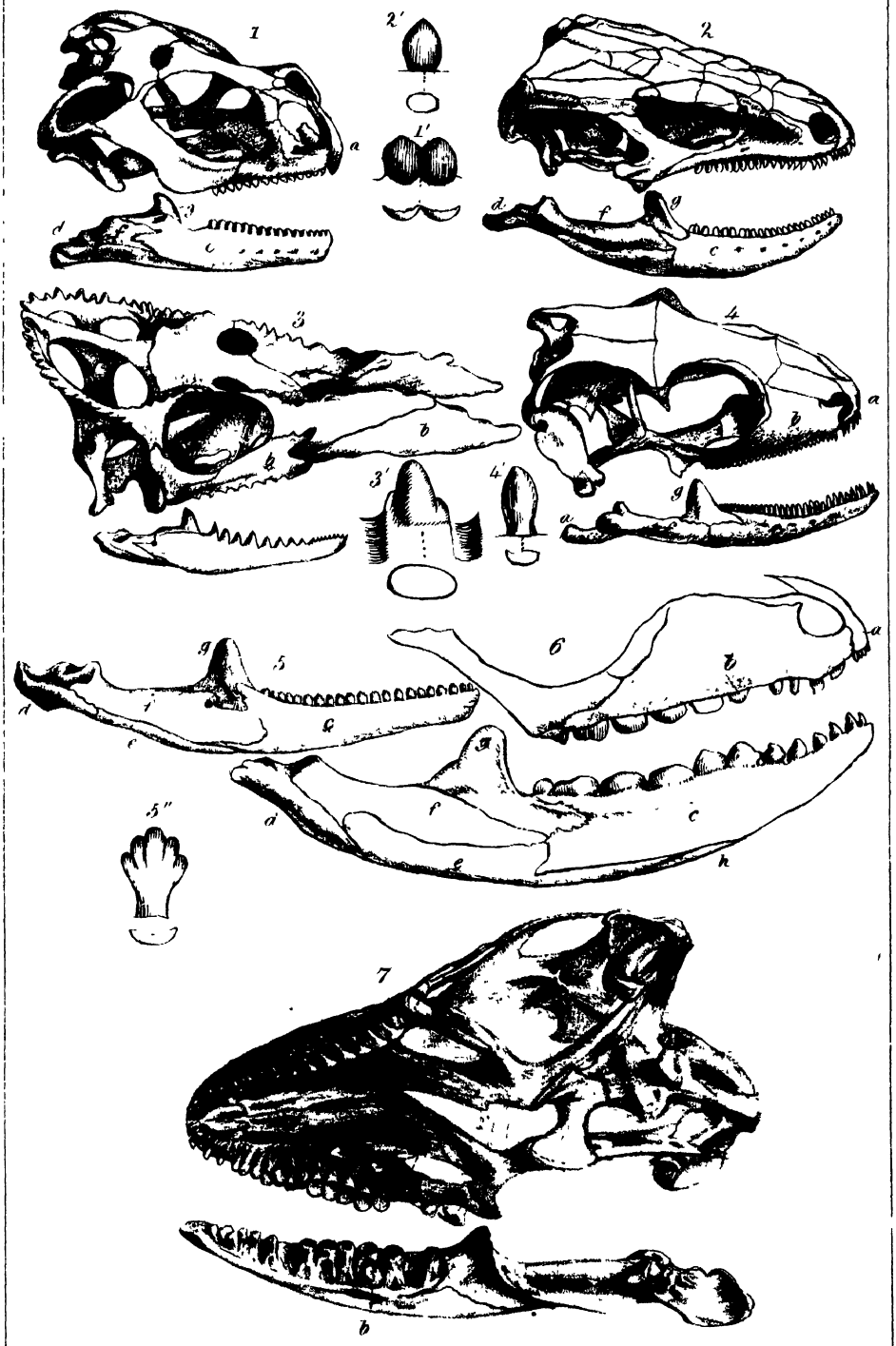




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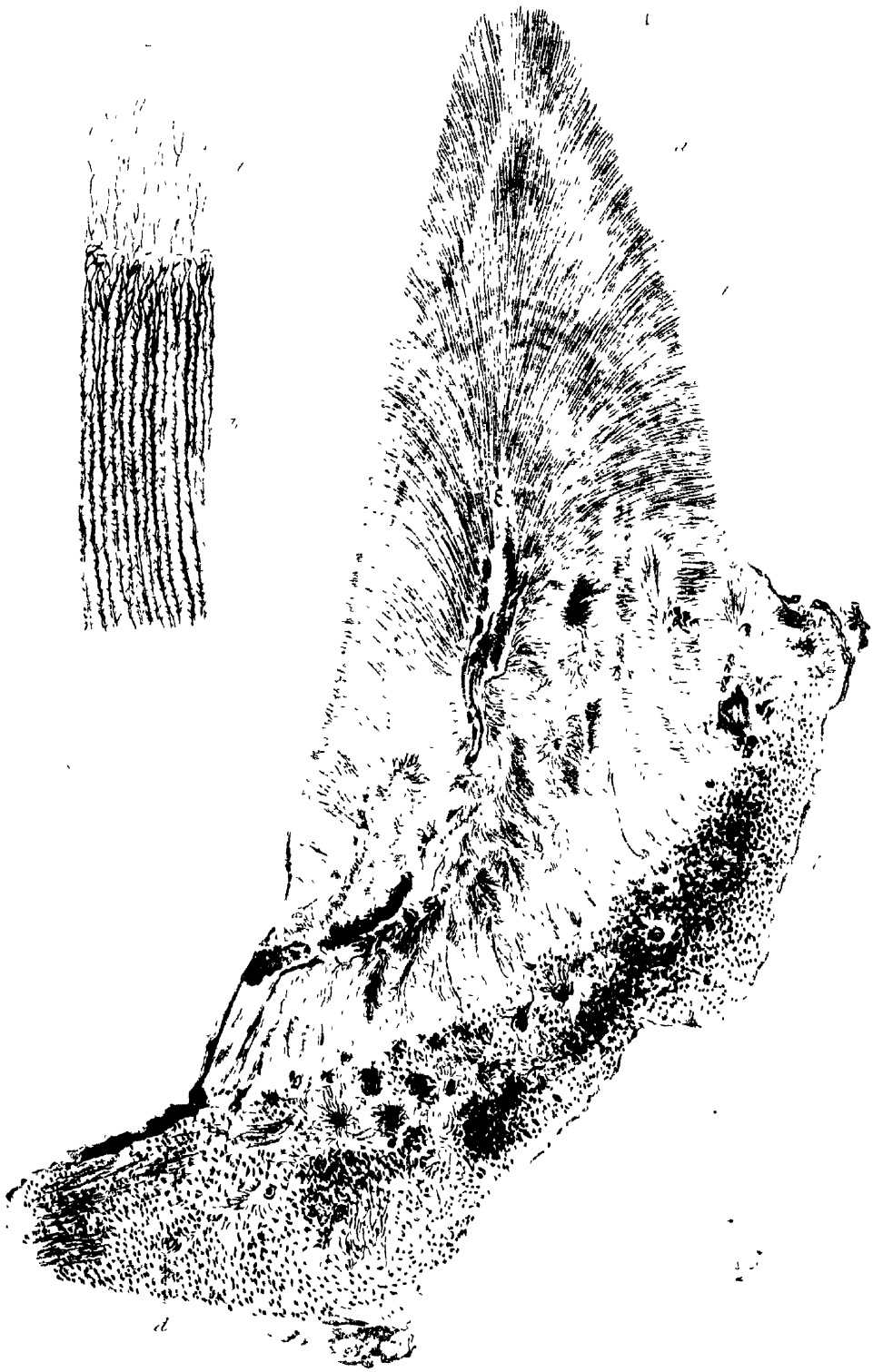
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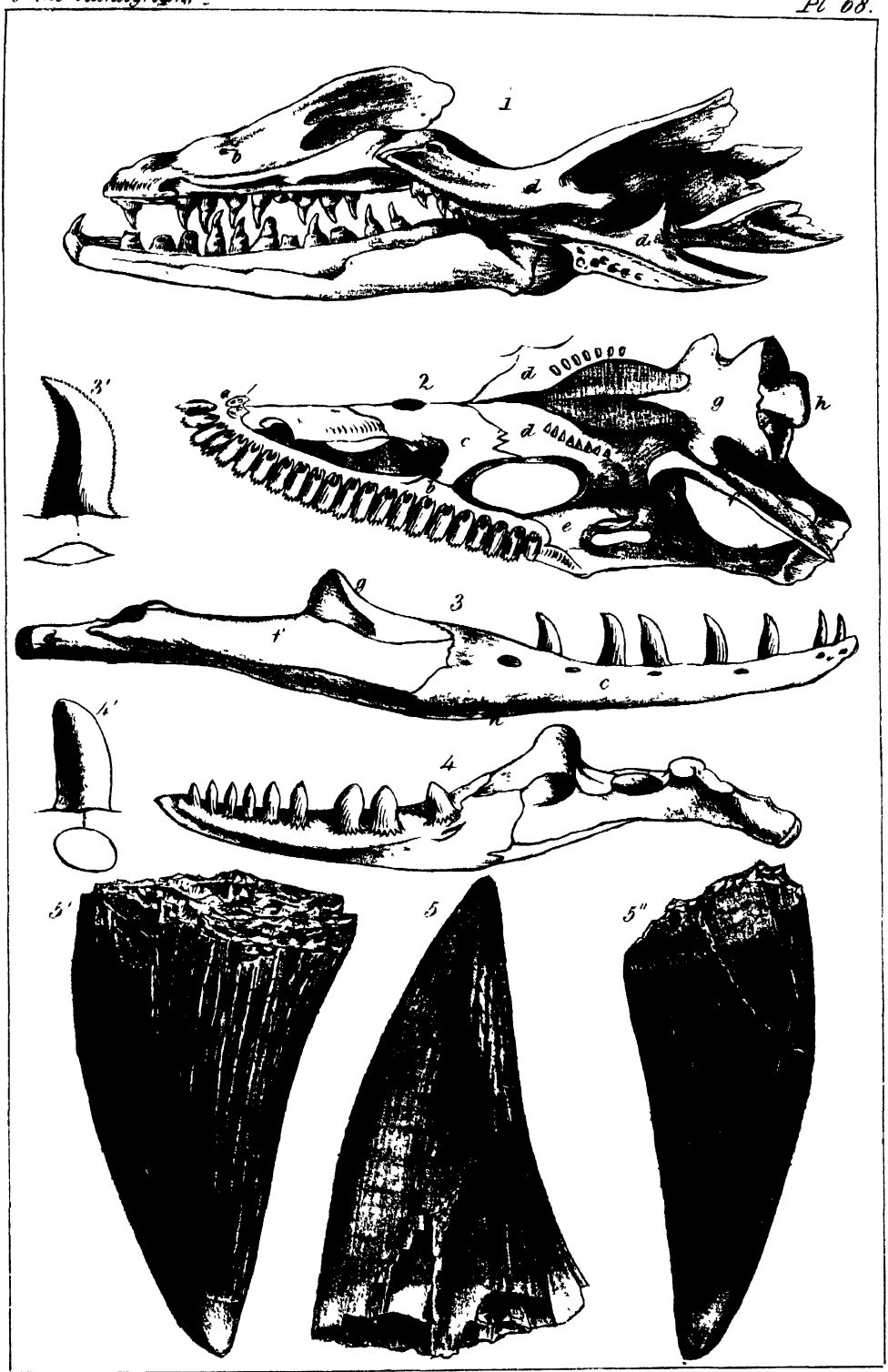
1 & 2. PYTHON.—3. IGUANA



Lem. Aldenac' del et Sinc

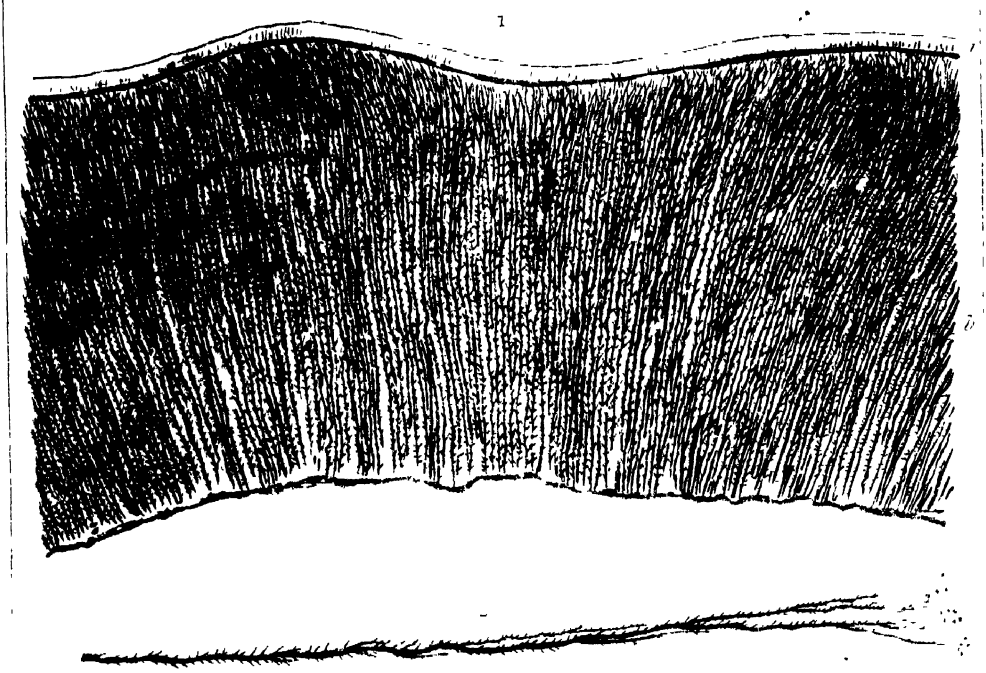
Day & Hughes, Lith.rs to the Queen

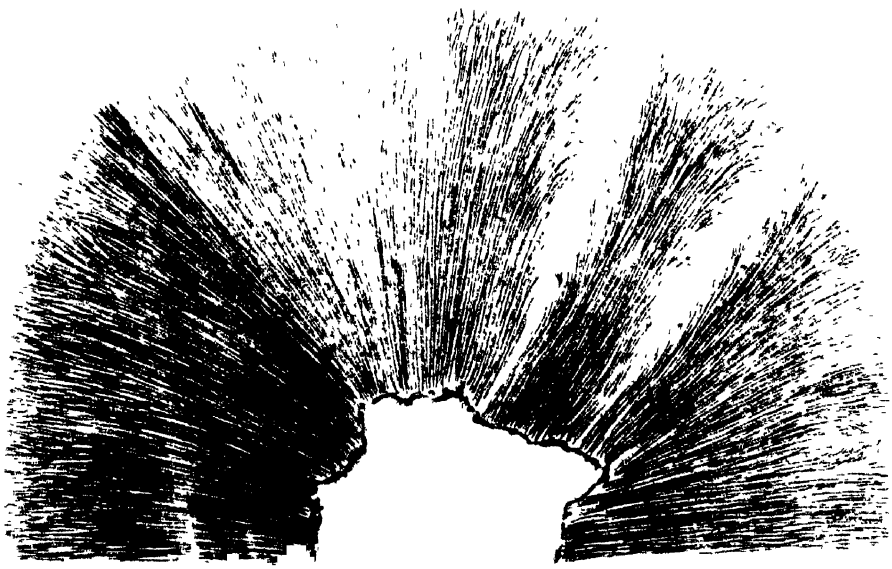

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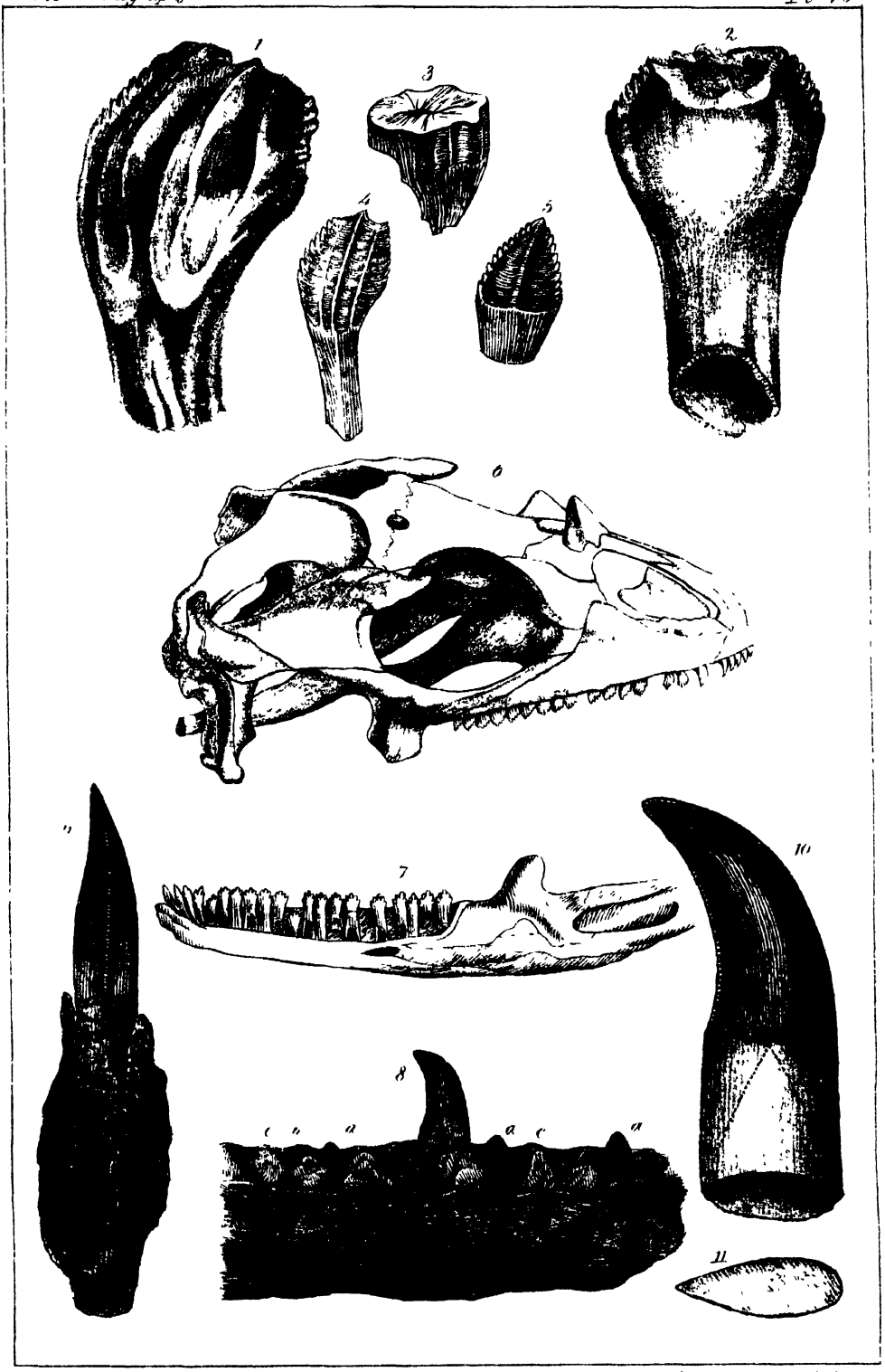


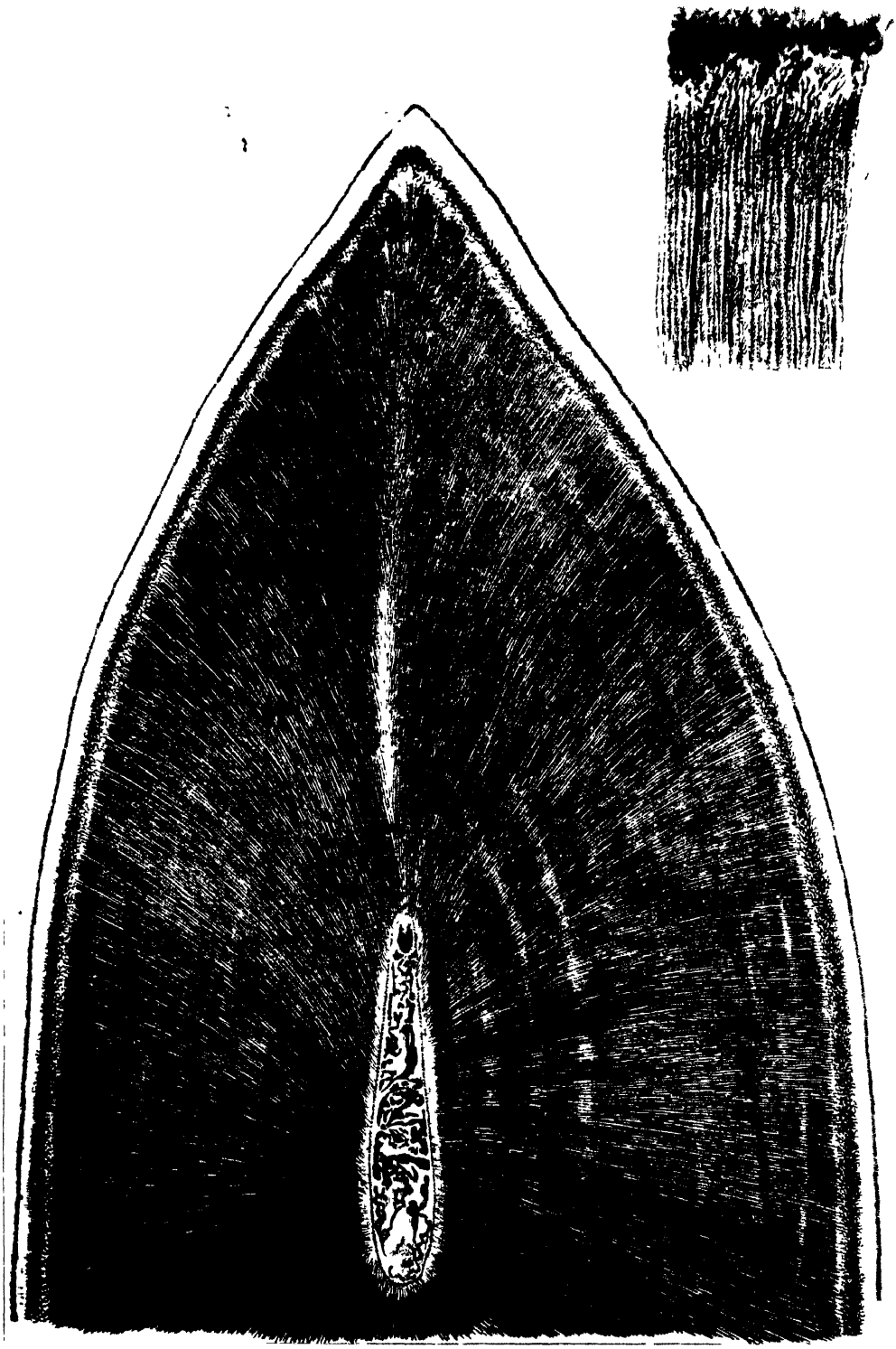
Jens Aldous, del et lith. Day & Haghe Lith.rs to the Queen

1 MOSASAURUS, - 2 IGUANA, - 3 4 MONITOR, - 5 PLEIOSAURUS



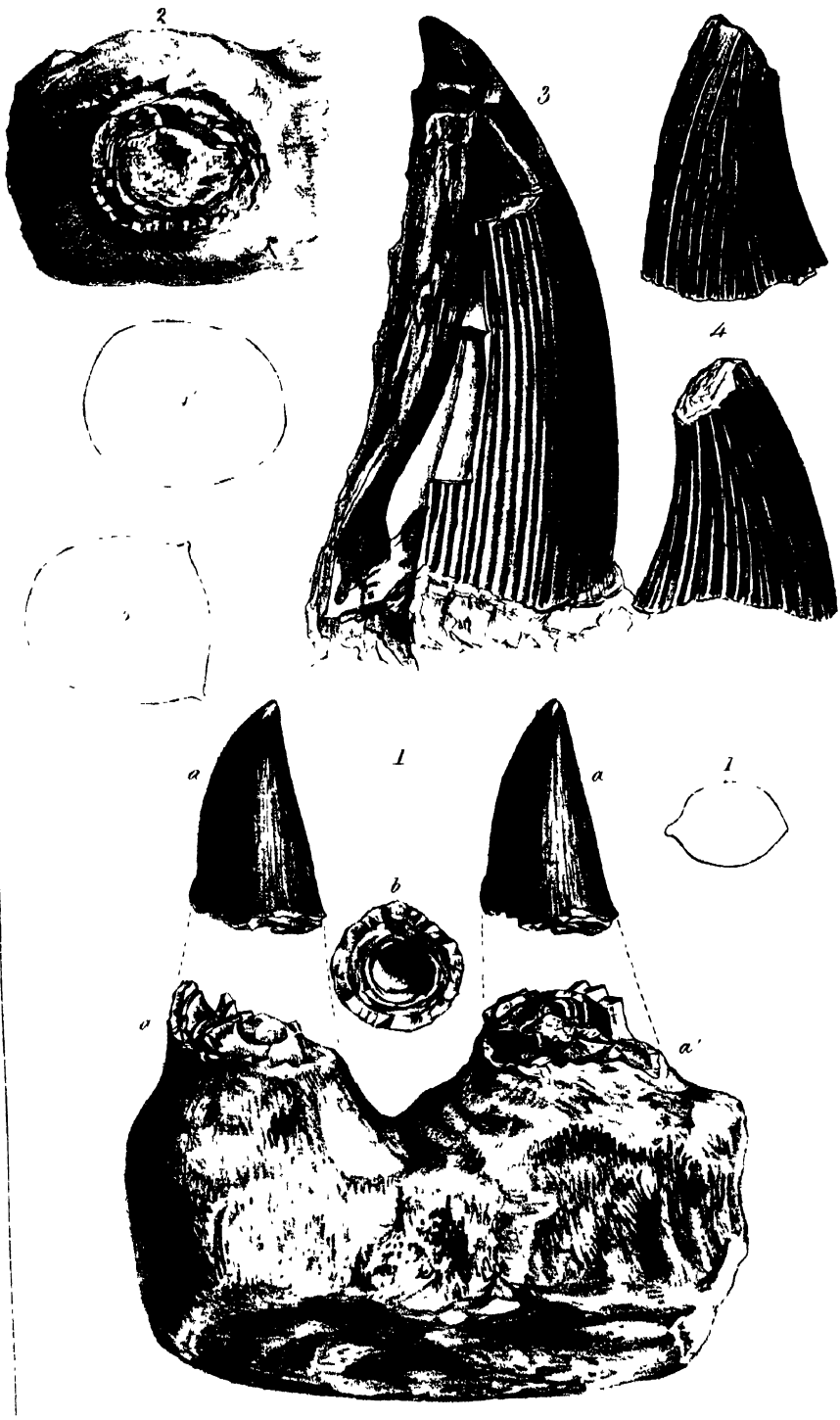



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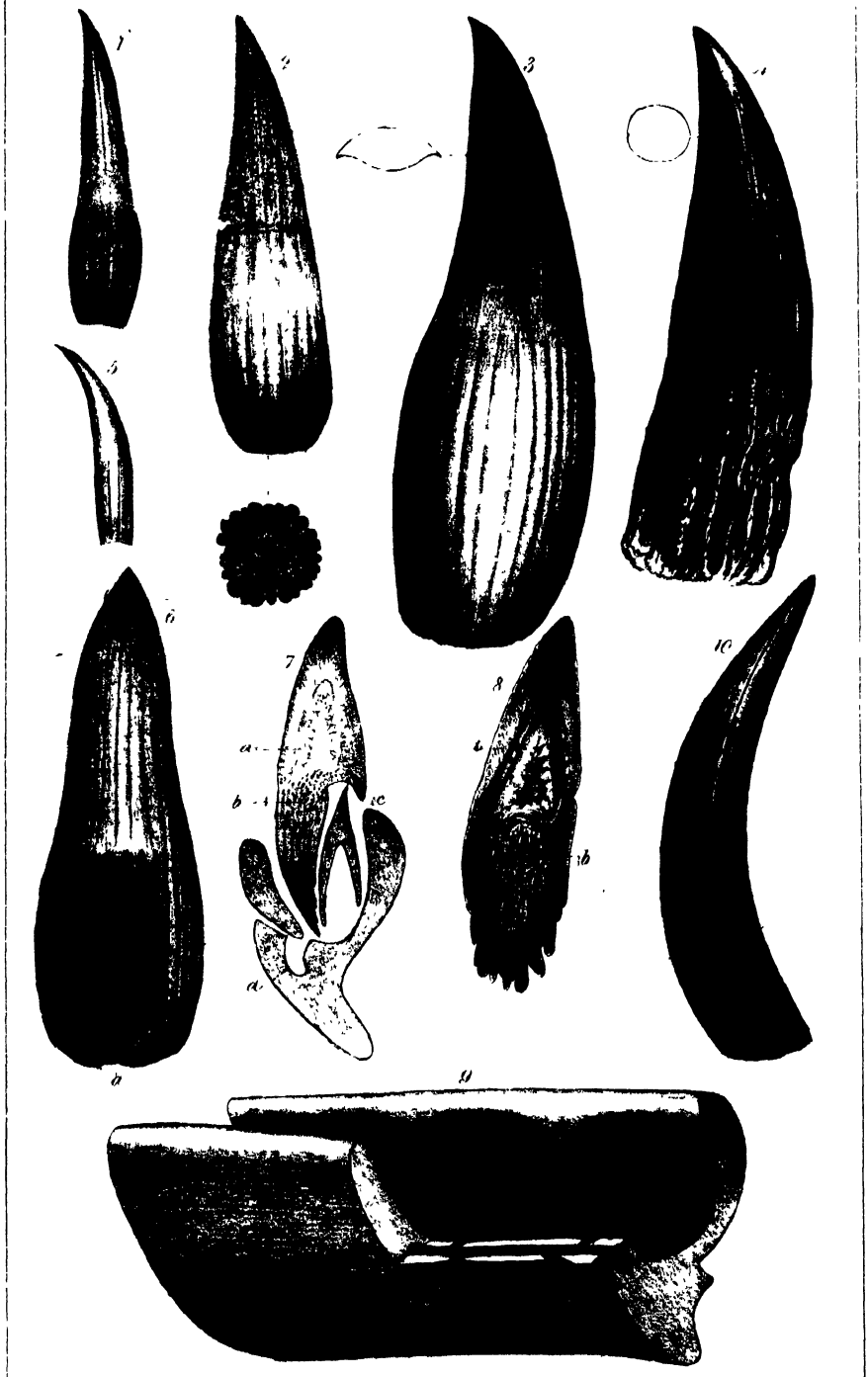
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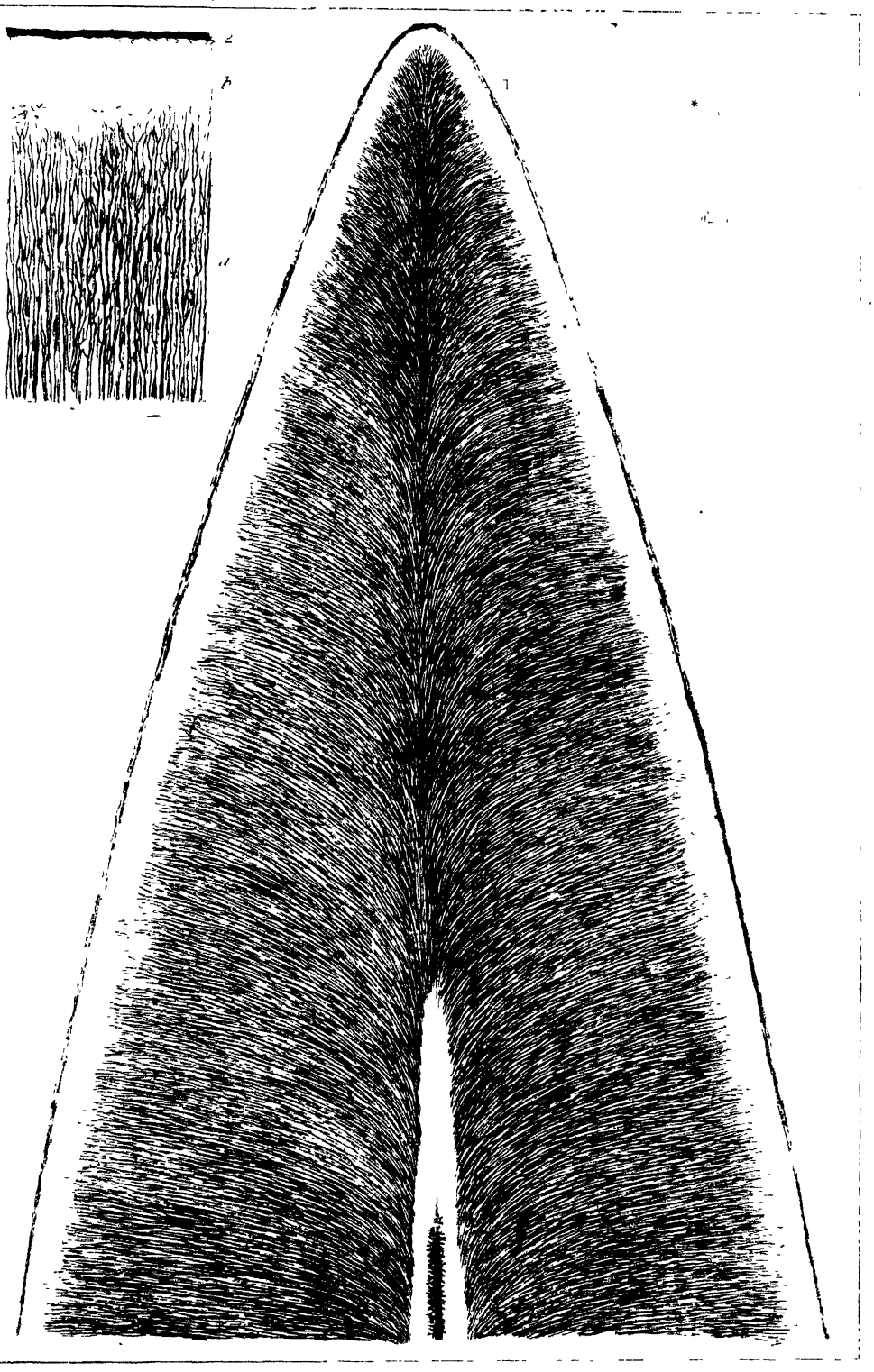
Dan'l Hughe Lith^rs to the Queen

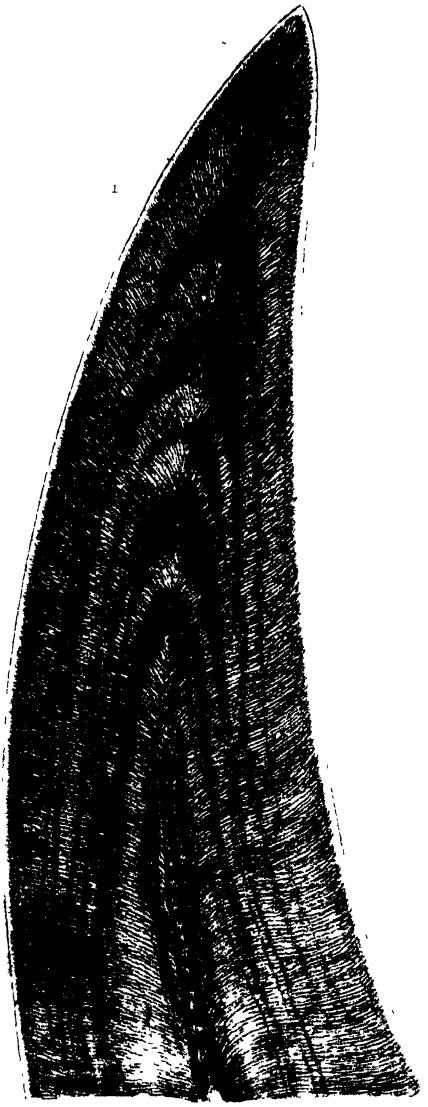
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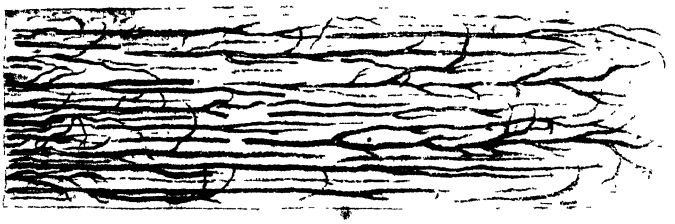


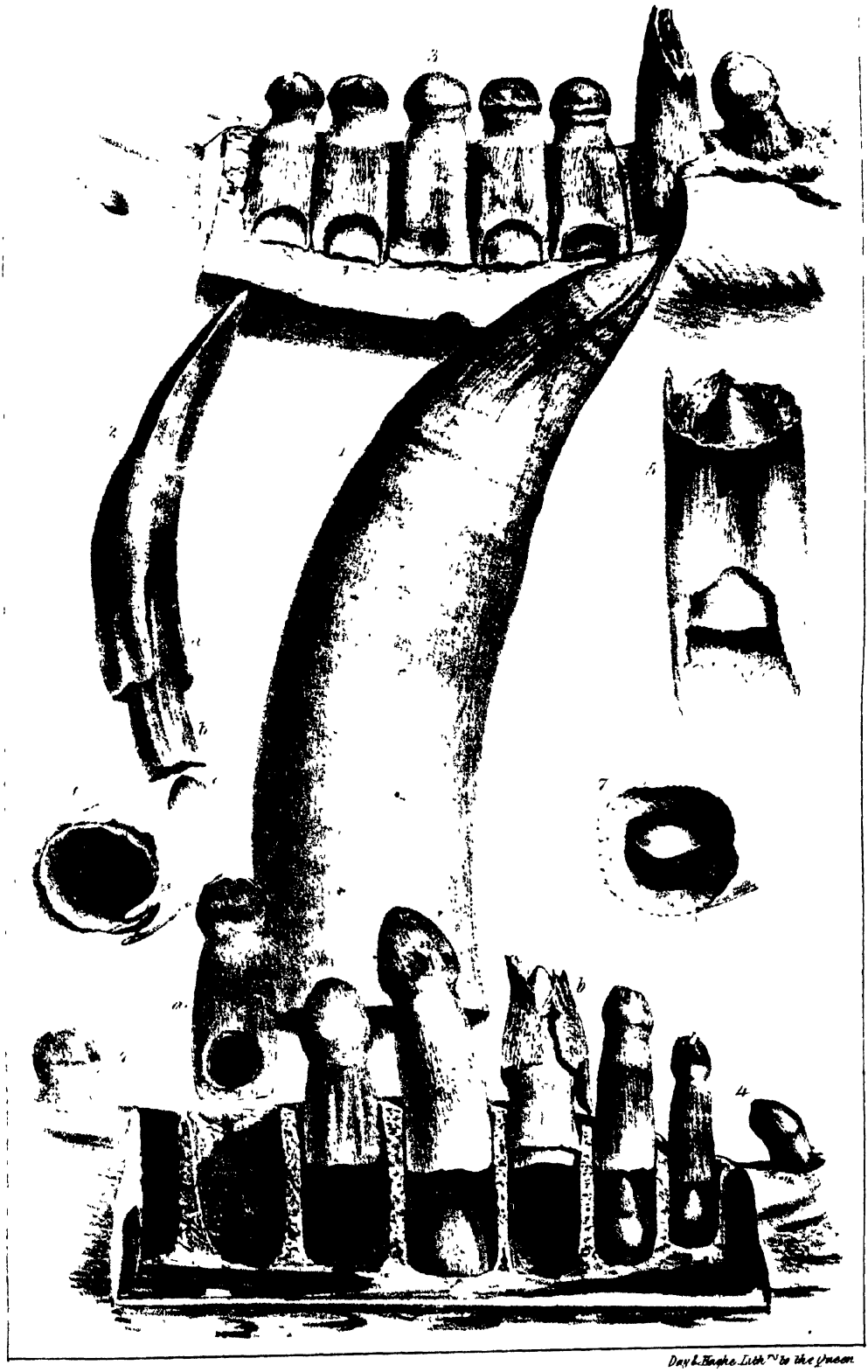
Day & Haghe Lith.rs to the Queen

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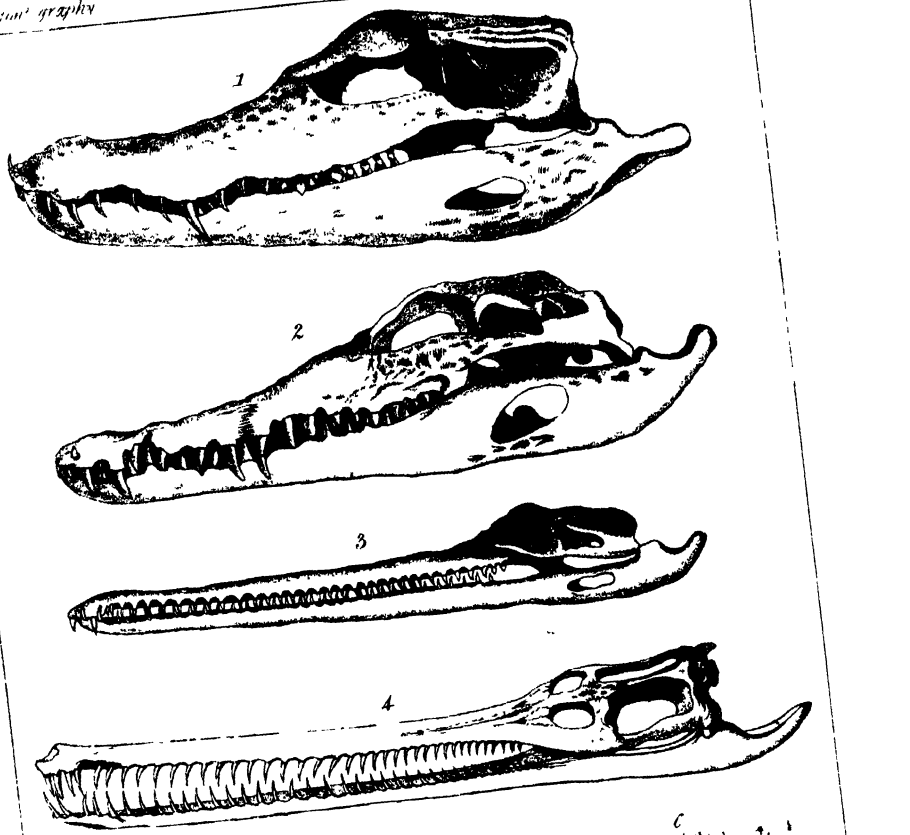


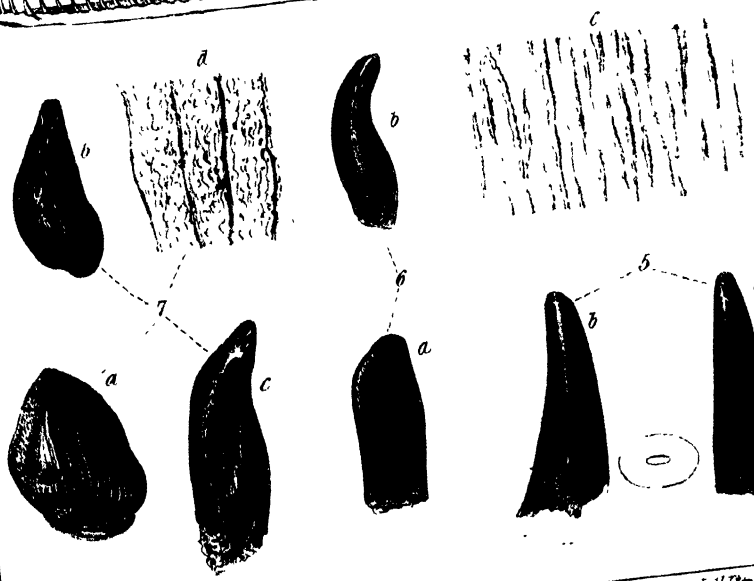






Day & Haghe Lith.rs to the Queen

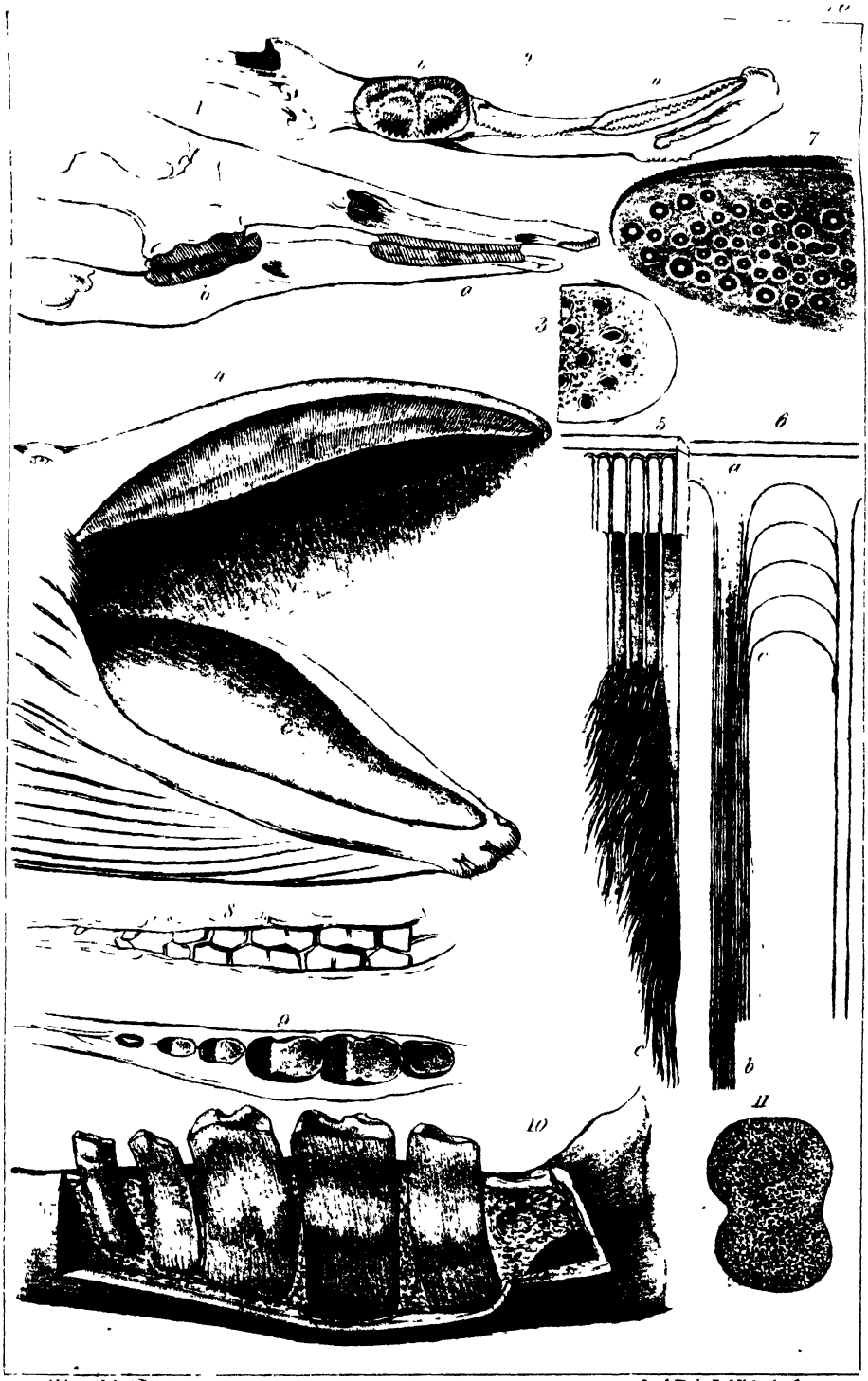




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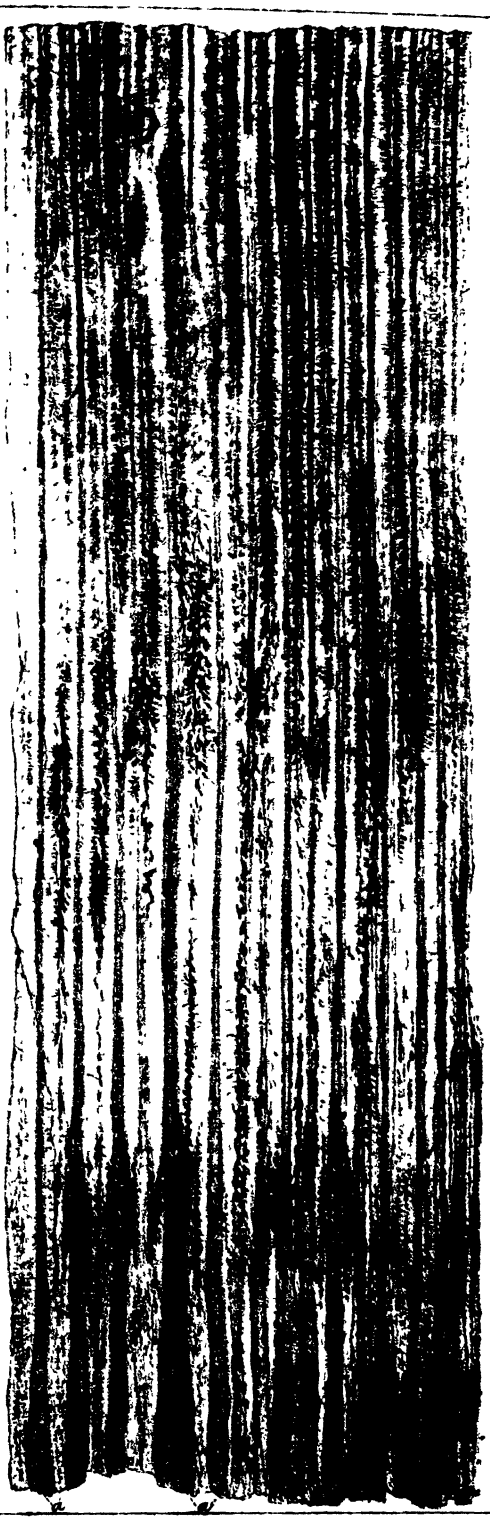
Lions del. & Lithe

CROCODILES.



Day & Haghe Lith.rs to the Queen

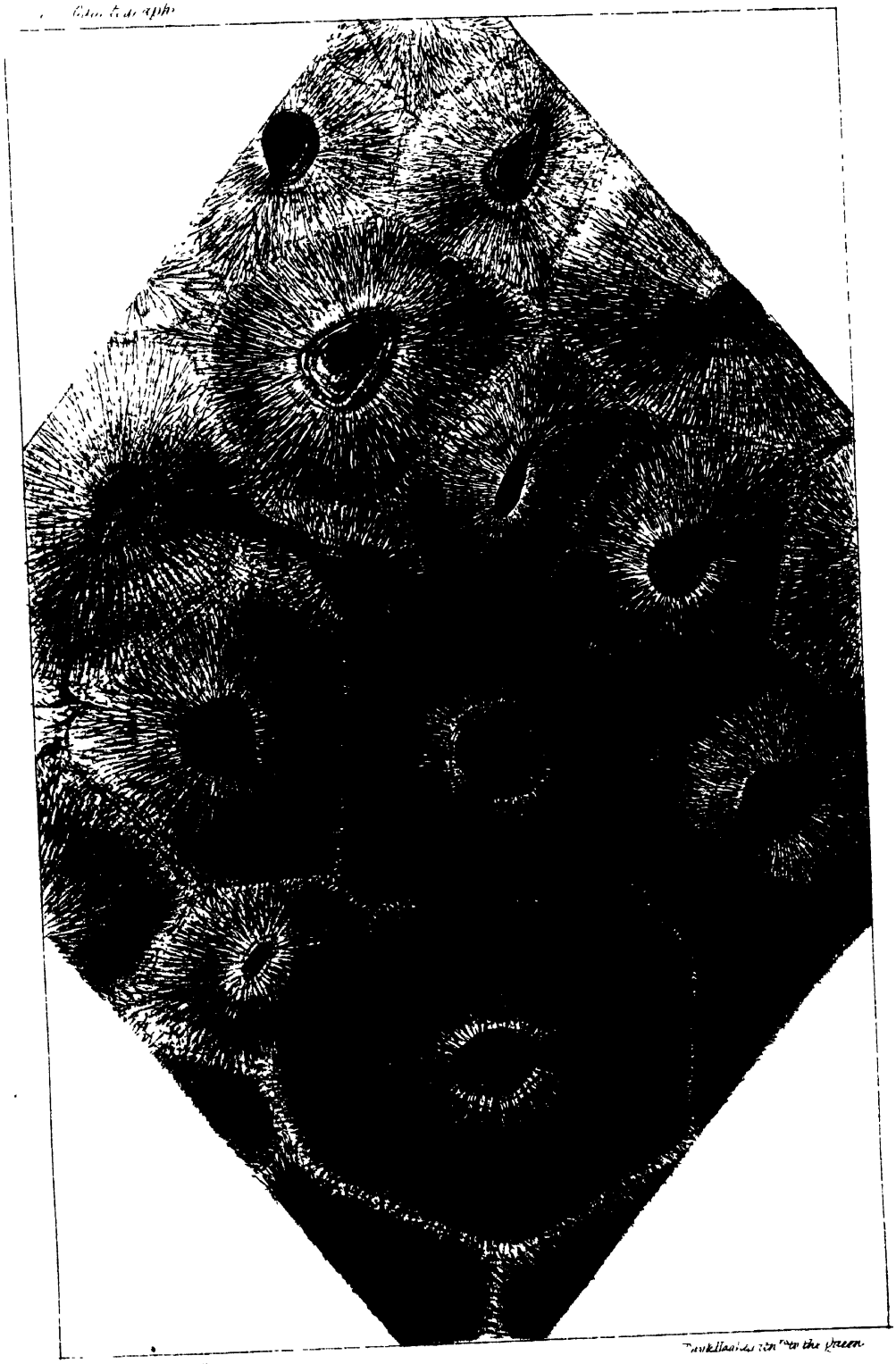
1 5 ORNITHORHINCHUS . 4 7 BALÆNA
8 11 OBYCTEROPUS



Sm. Aldeman, del. et sculp.

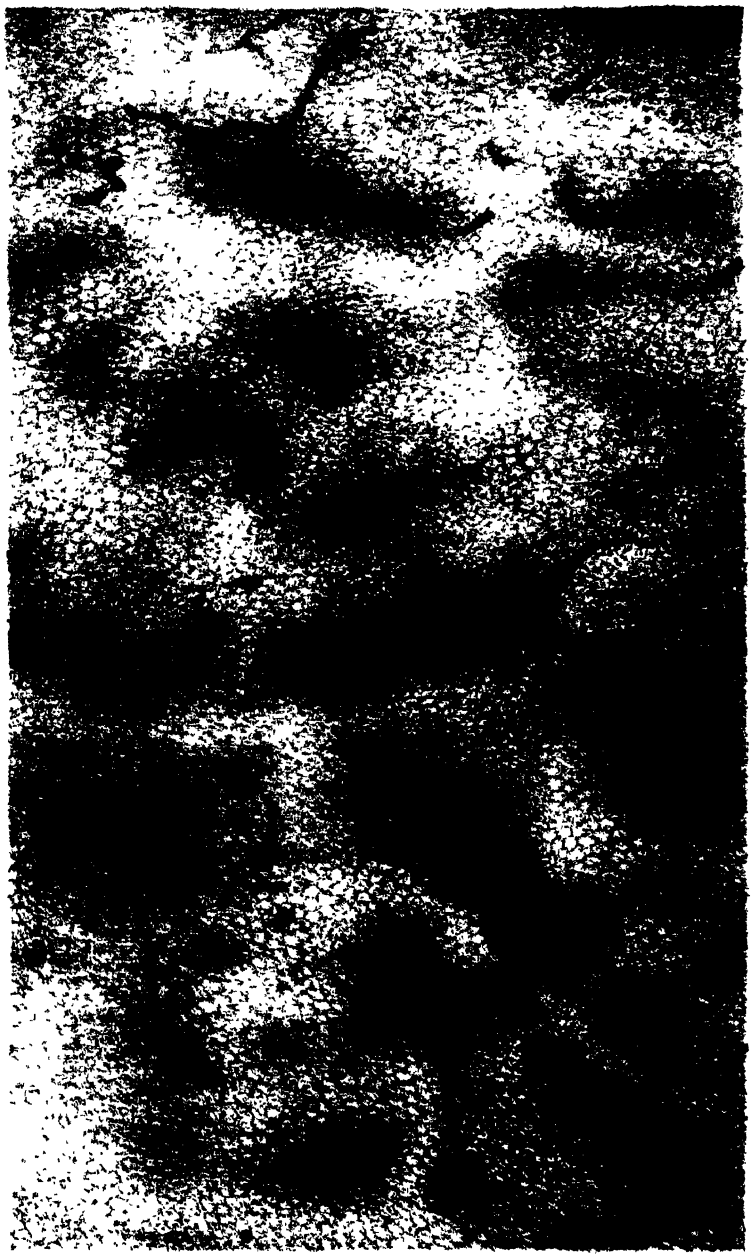
Dan. Lizars, Edinburgh

ORYCTEROPUS

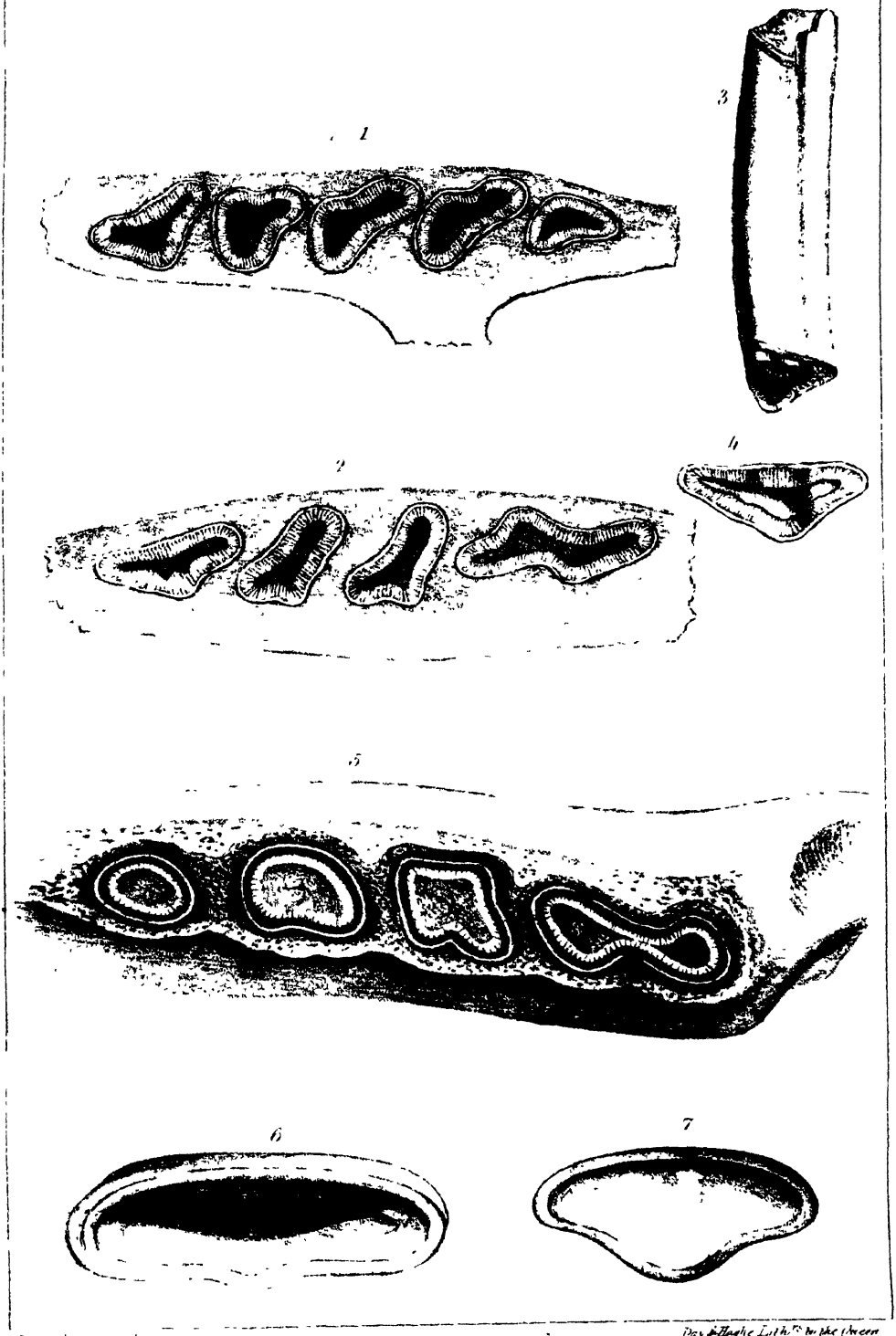


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OCYTEROPUS



MYLODON.

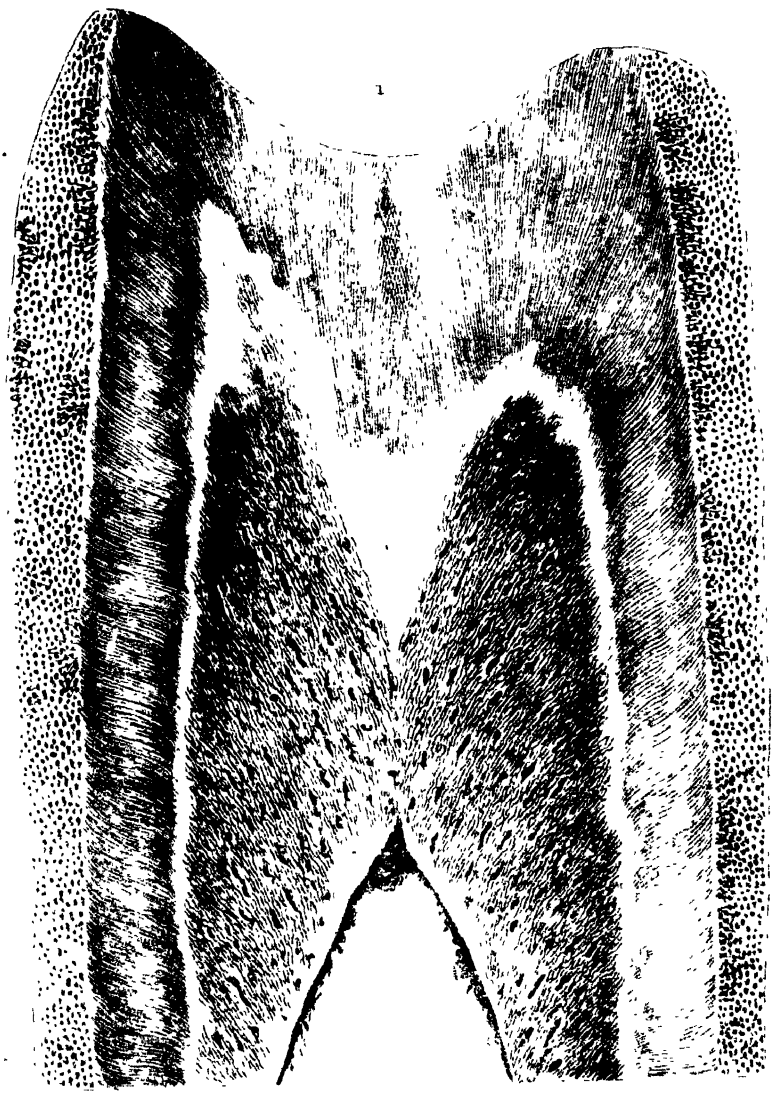


Day & Haghe Lith.rs to the Queen

1 2 3 MYLODON 4 5 6 7 MEGALONYX

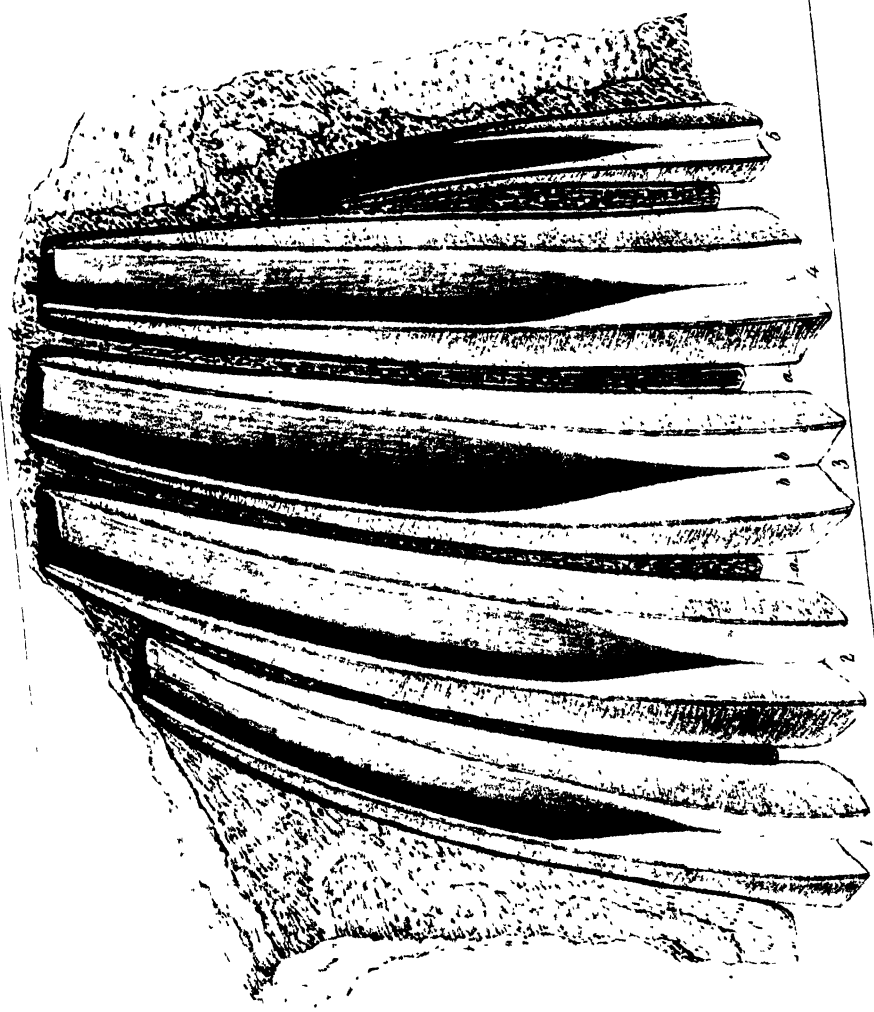


SLOTHS





Ornithography

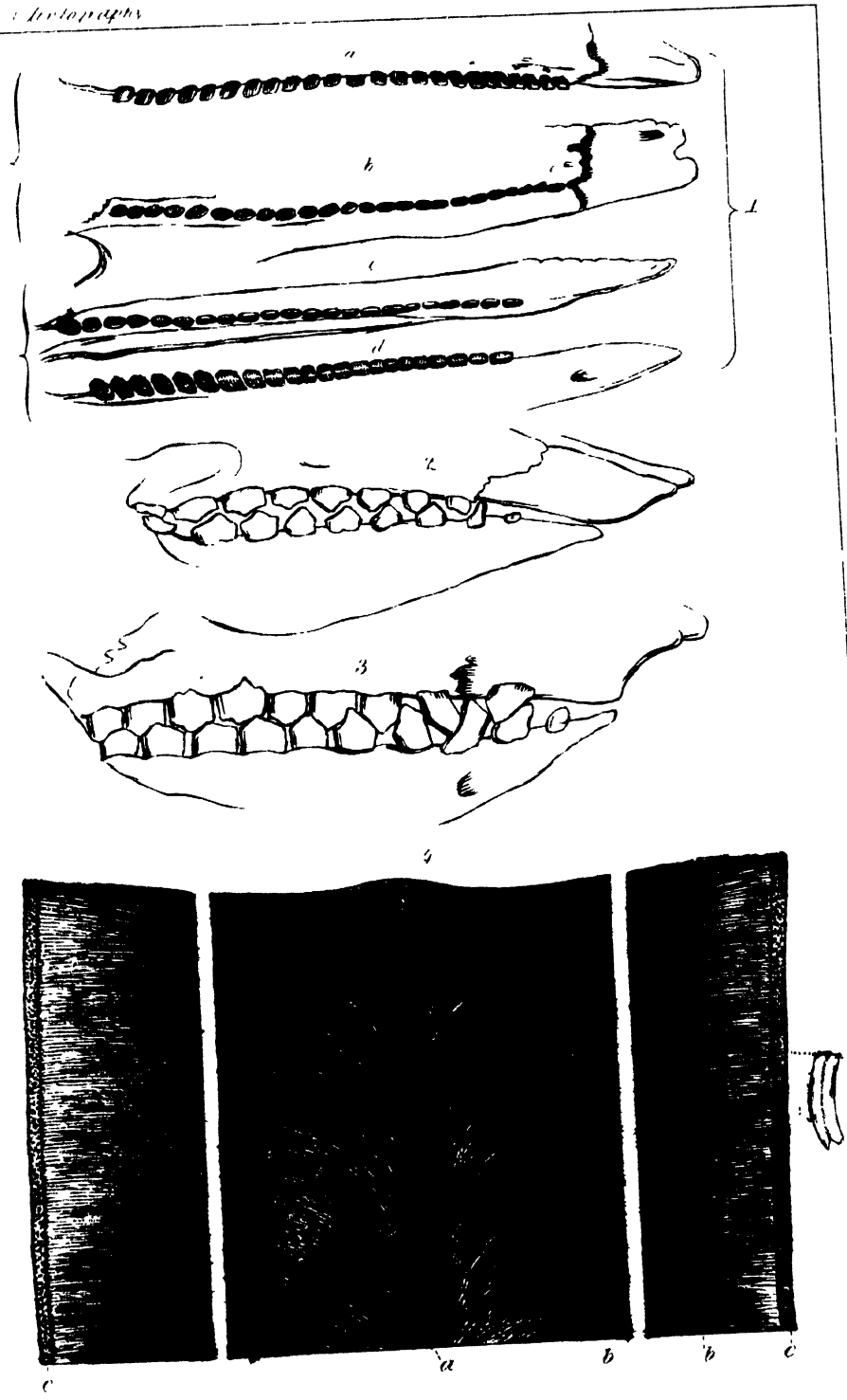


Drawn Hasheluth to the Queen



Drawn & Lithgh. Lith.rs to the Queen

MEGATHERIUM



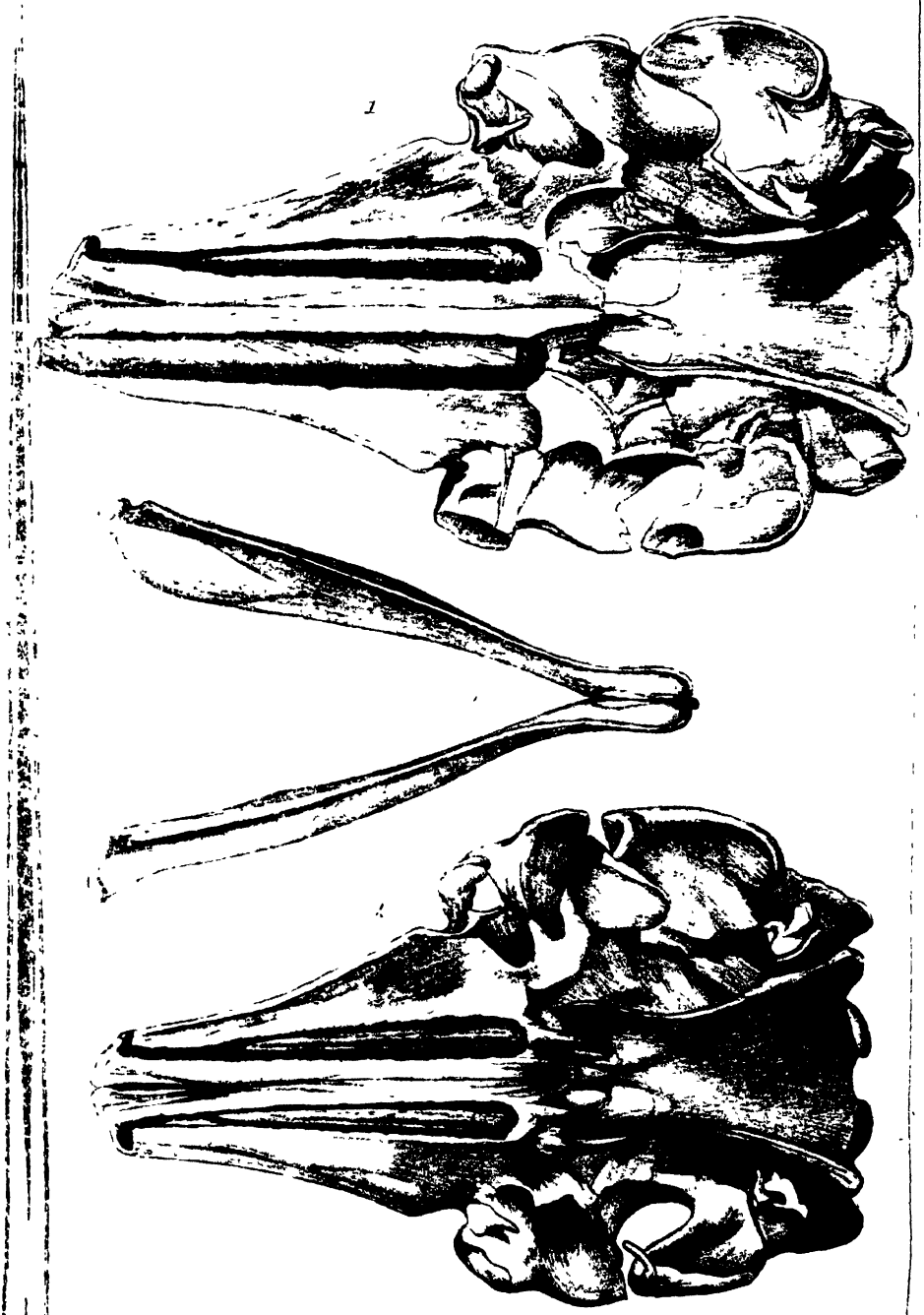
Dan.l Frahe Sculp.r to the Queen

PASYPUS



Dan.l Bingham Lith.r to the Queen

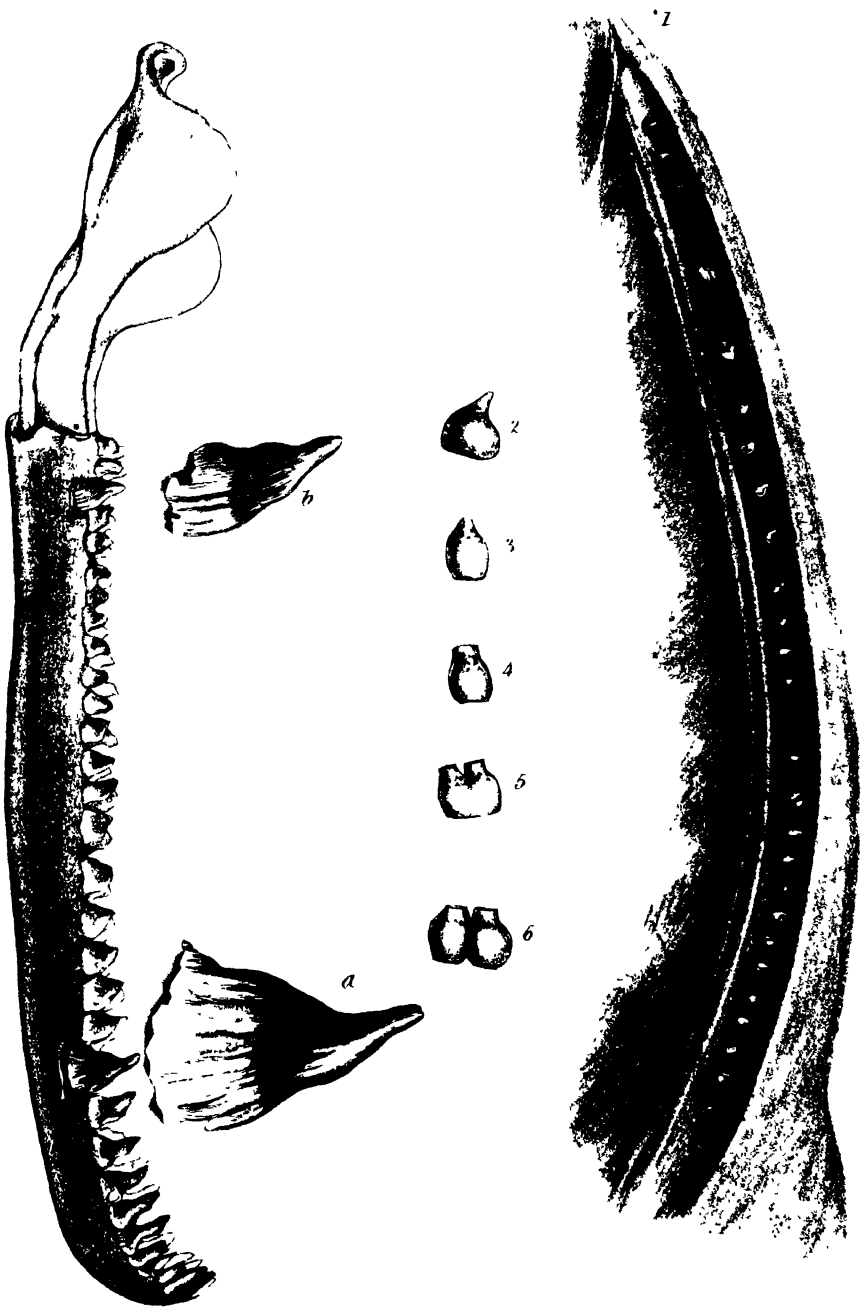
1 3 GLYPTODON. 4 5 TOXODON.



Lemercier Lithog. et Imp.

Pauk. Hughes Tilt. to the Queen

NARWHAL



Lens Aldous del. & lith.

Day & Haghe Lith.rs to the Queen

1 & 2 BALÆNA. 7 PLATANIS

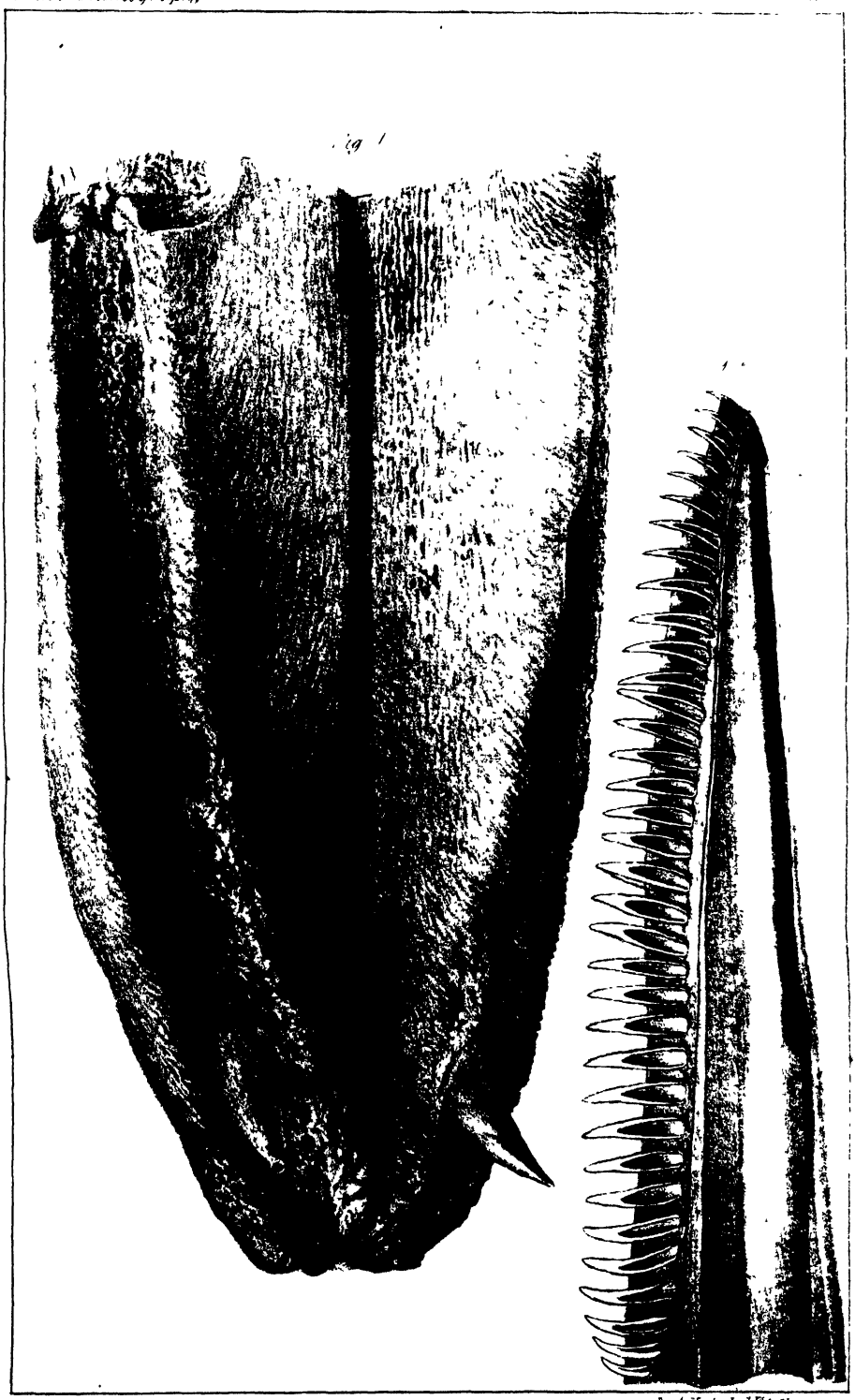
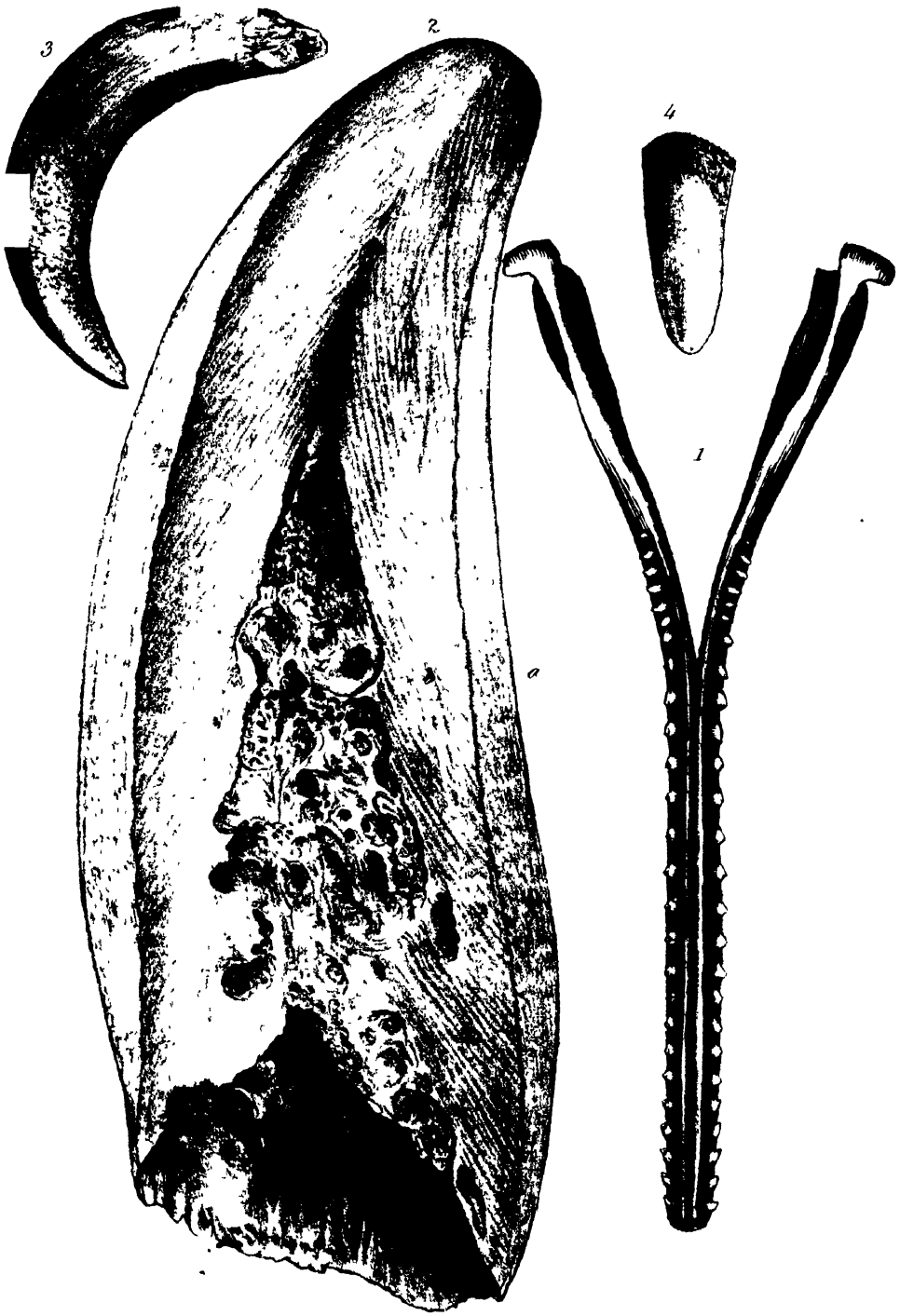
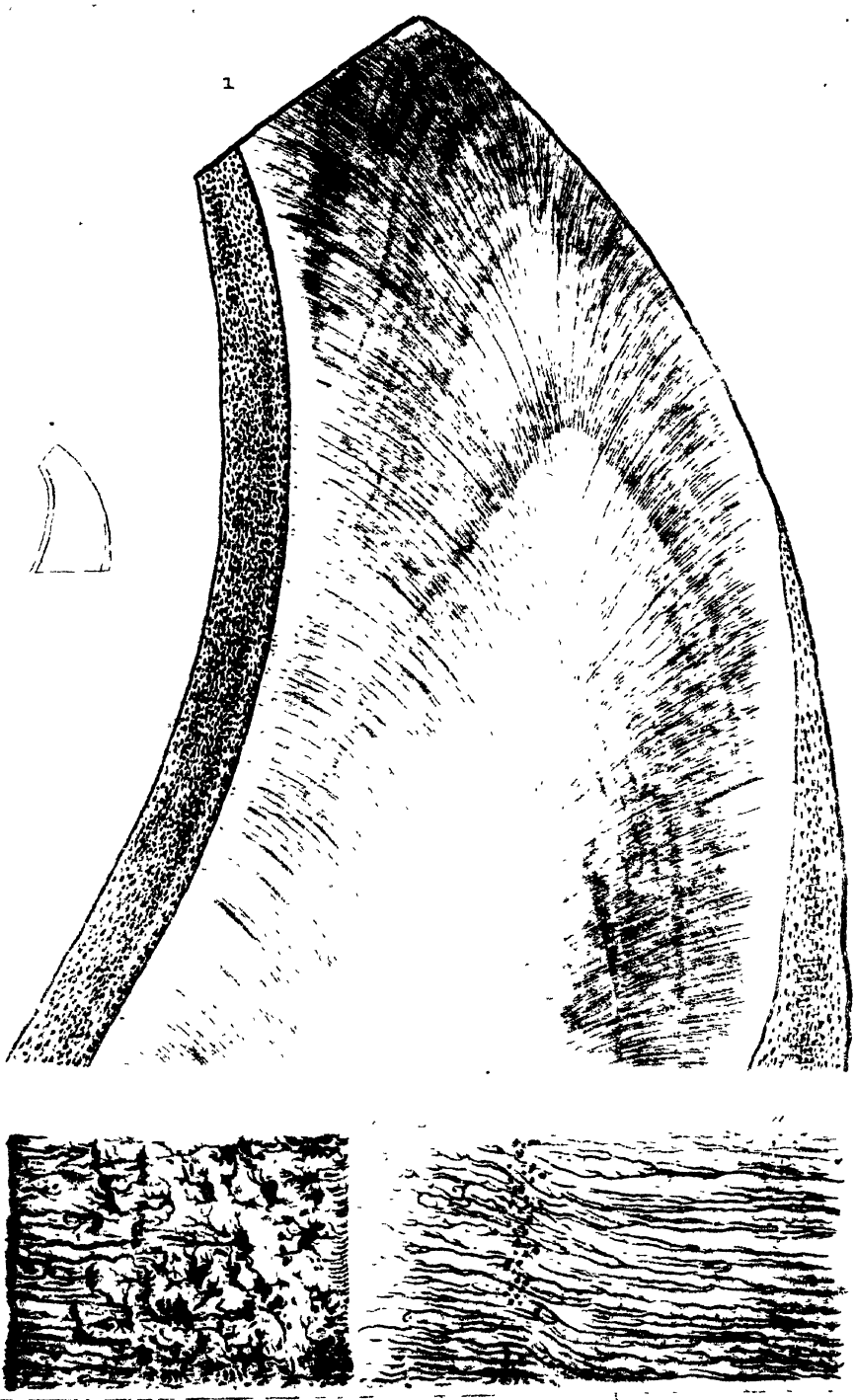
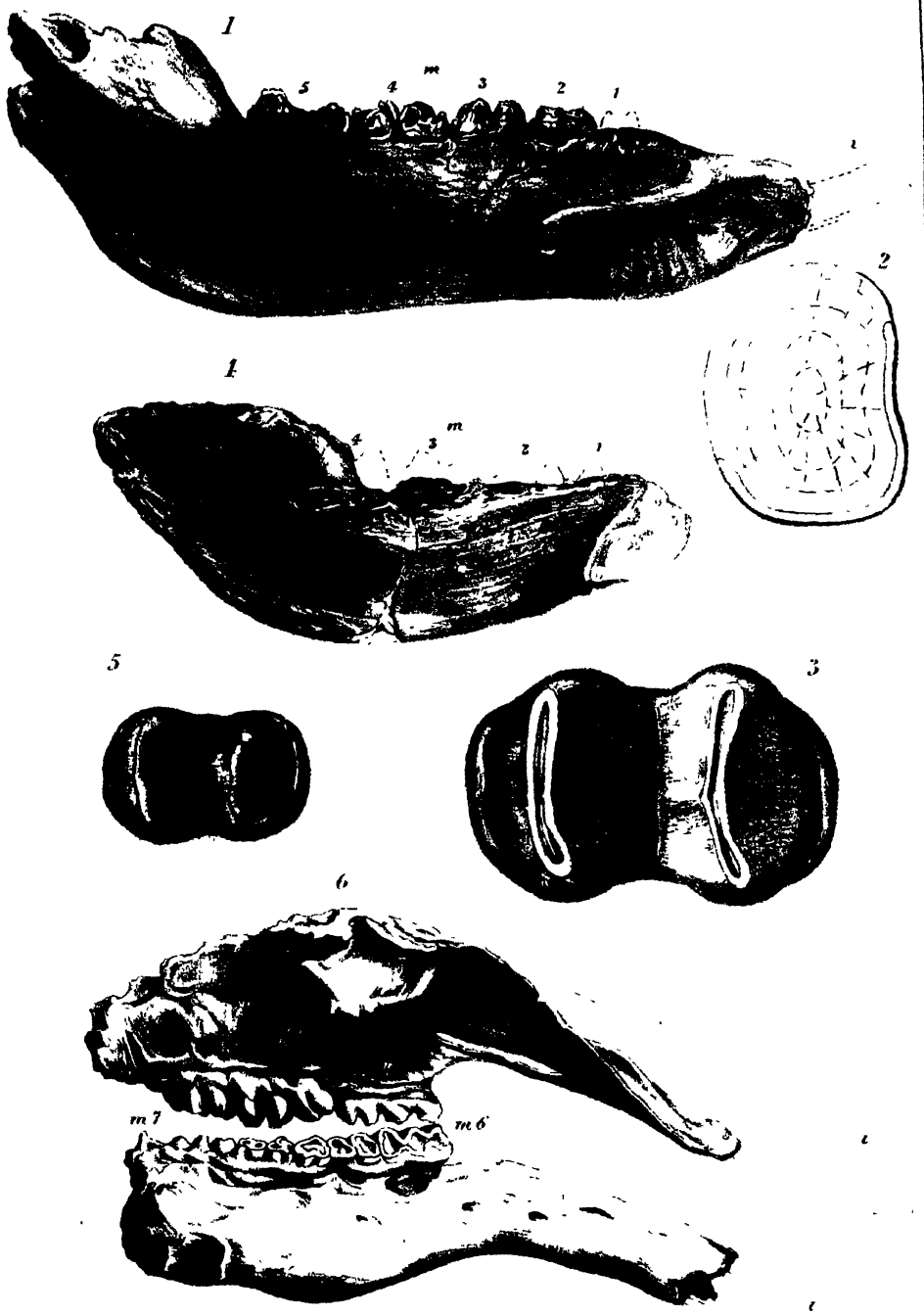


Fig. 1. HYPEROODON.—Fig 2. DELPHINUS.


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CACHALOT

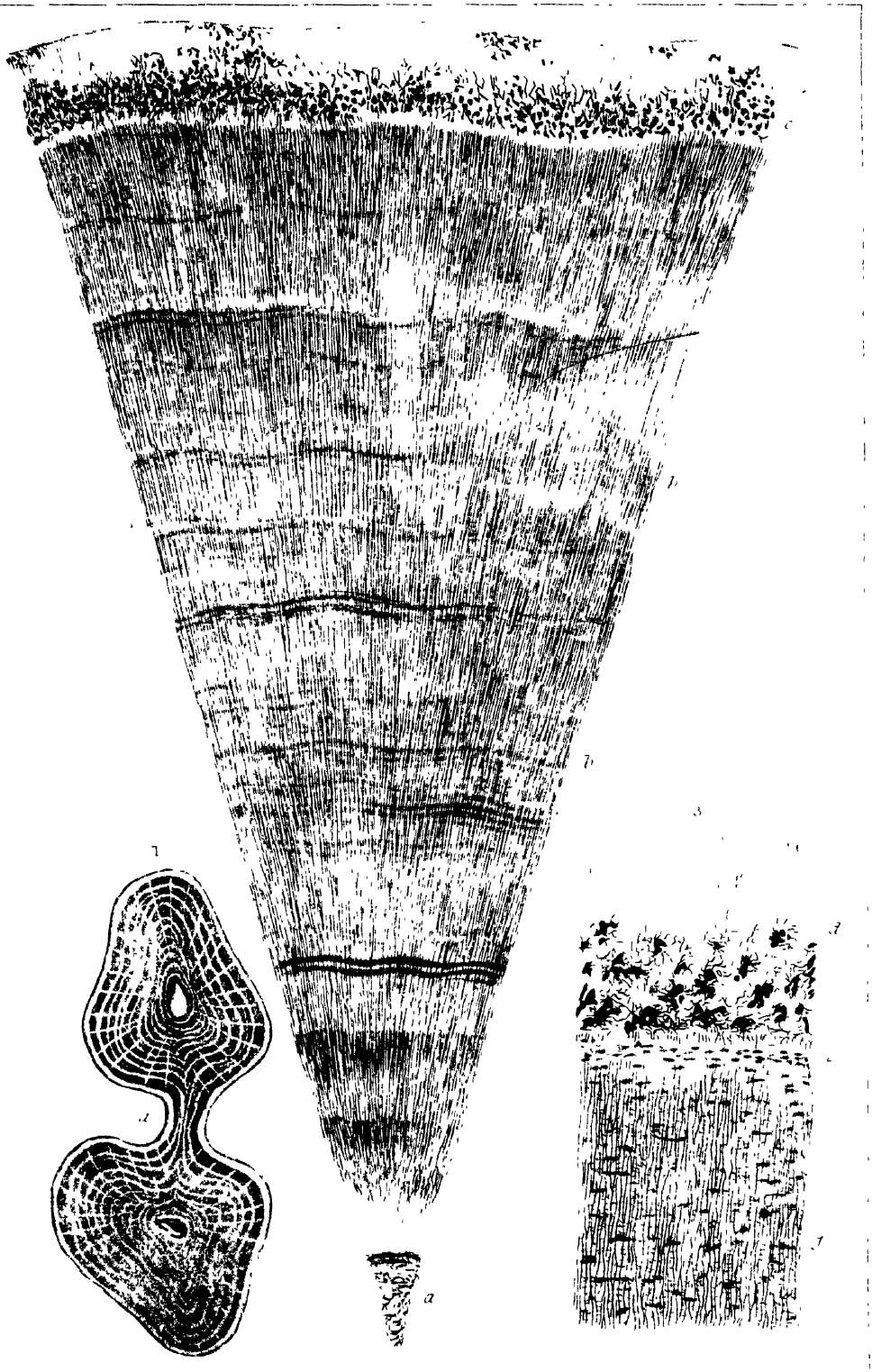


On Zinc by J. Erxleben

Da. & Haghe Lith to the Queen

1,3. DIPROTODON 4 NOTOTHERIUM 6 MASTODON

London. Published by J.E. Baillière 1845

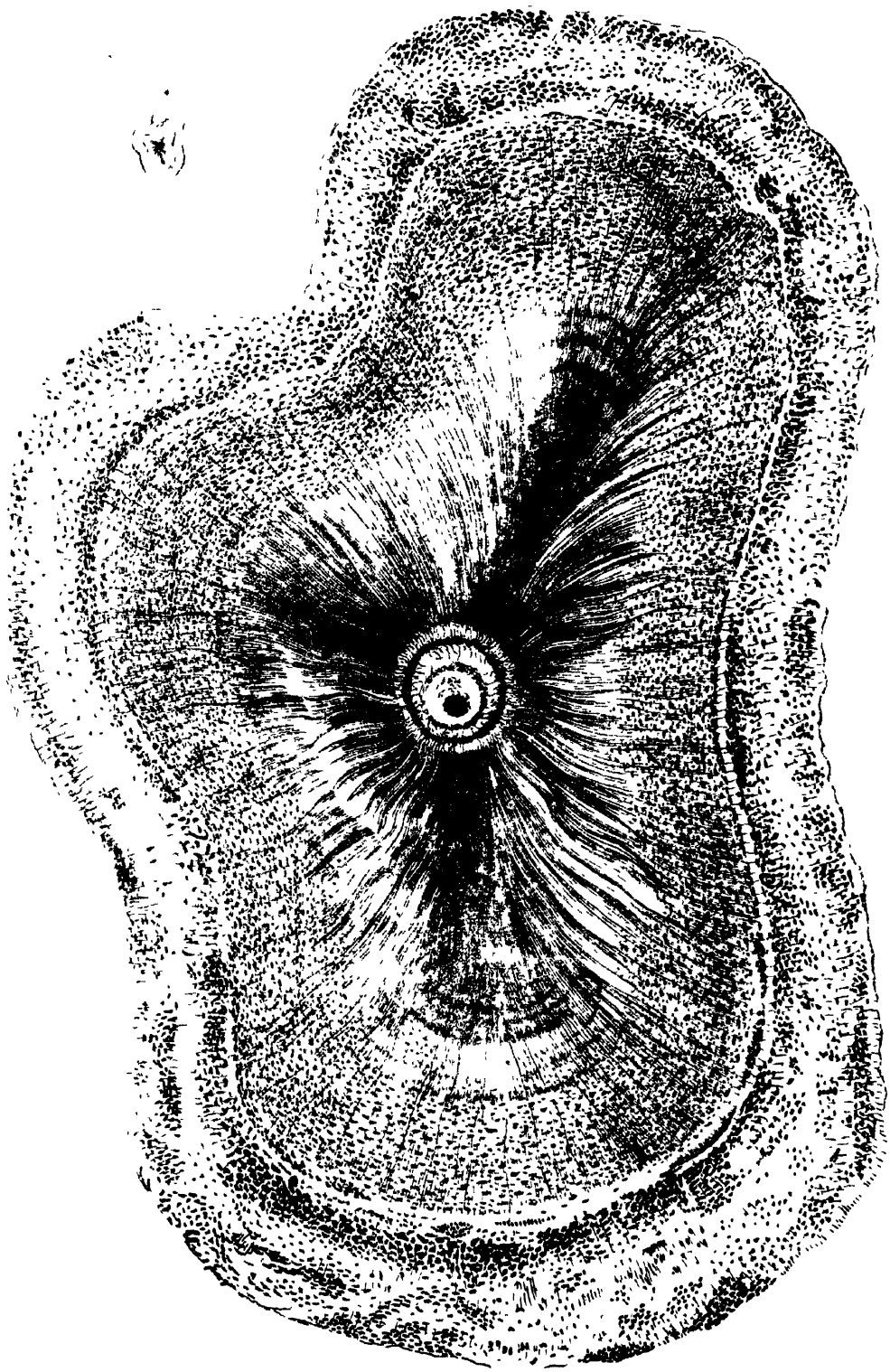



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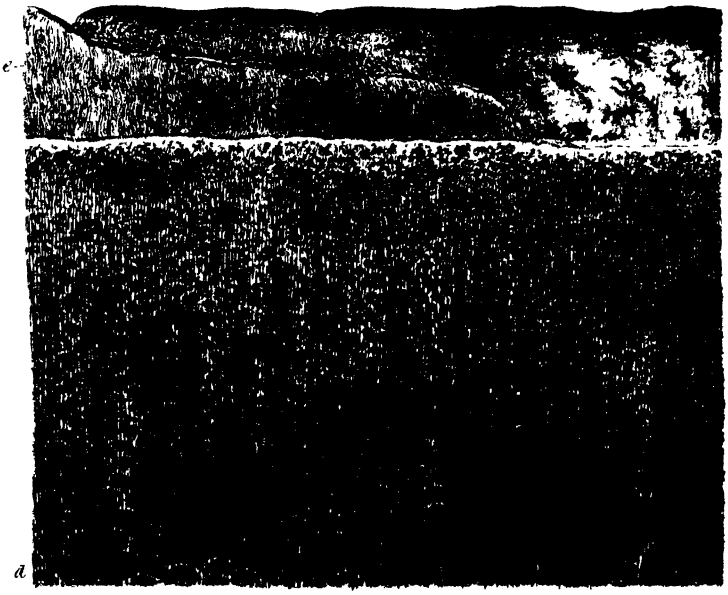


Jones Aldoms, del et lithe Dop & Hagbe Lith.rs to the Queen

DUGONG

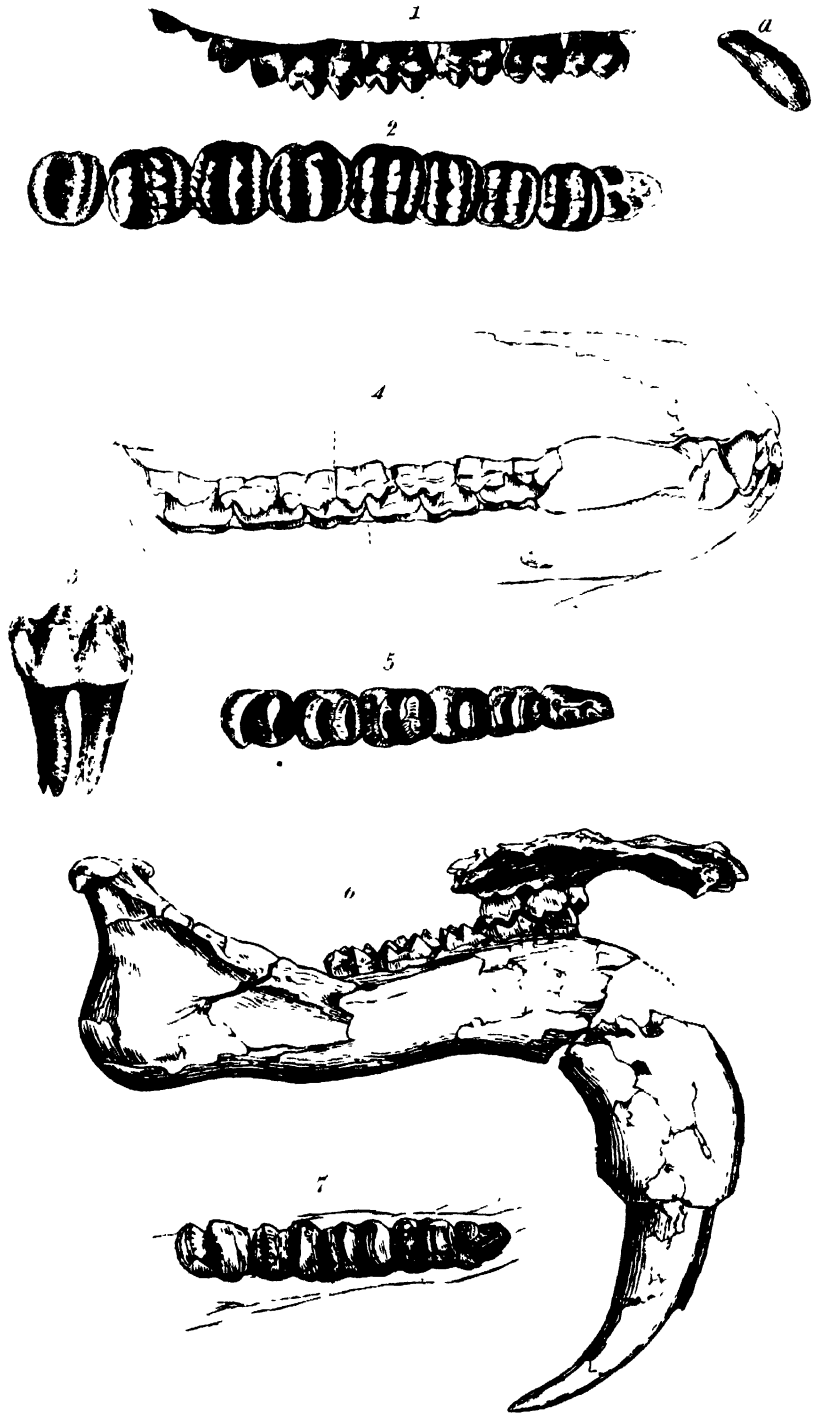


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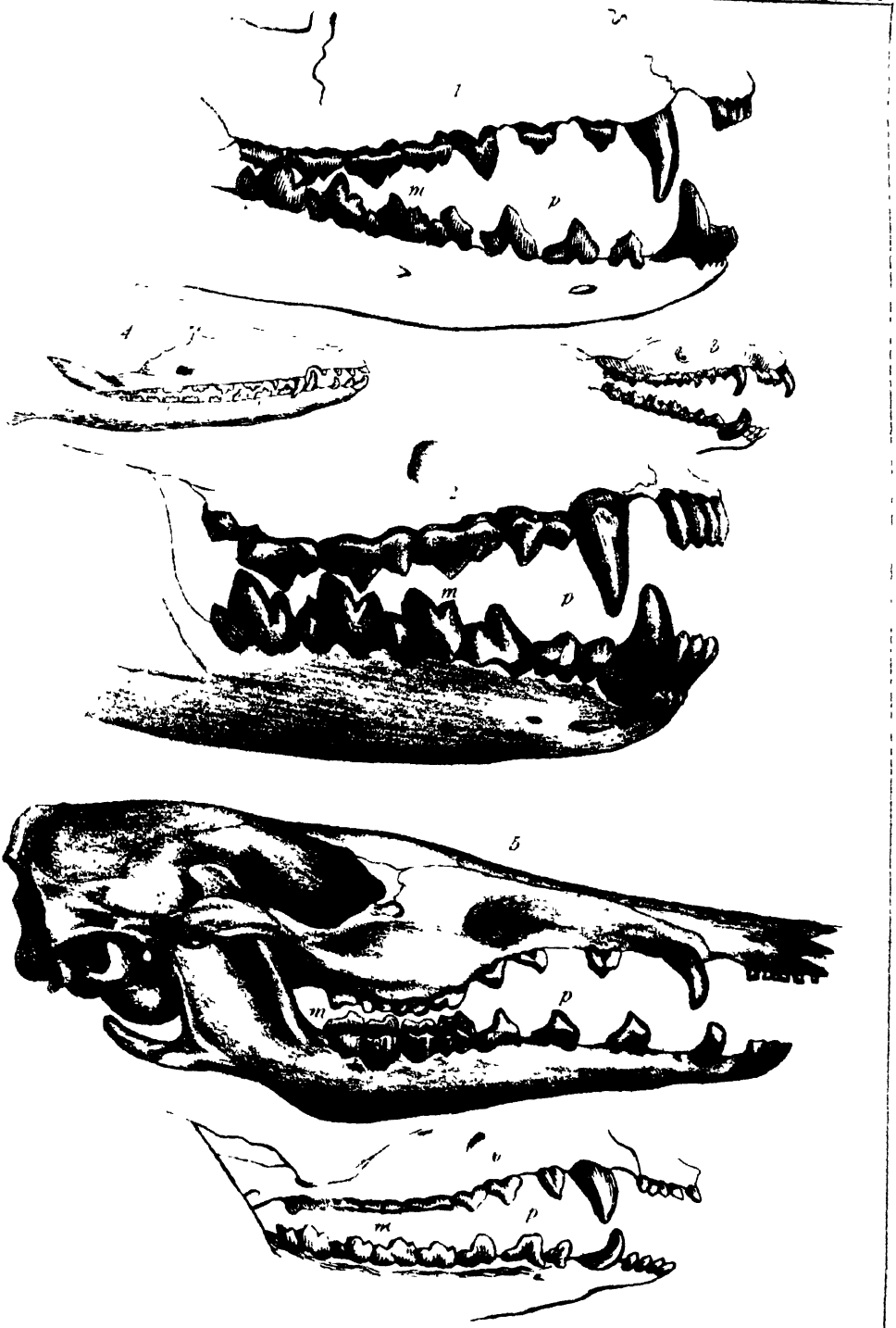
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Lens Aldrus del. & fec.
Day & Haghe, lith.rs to the Queen

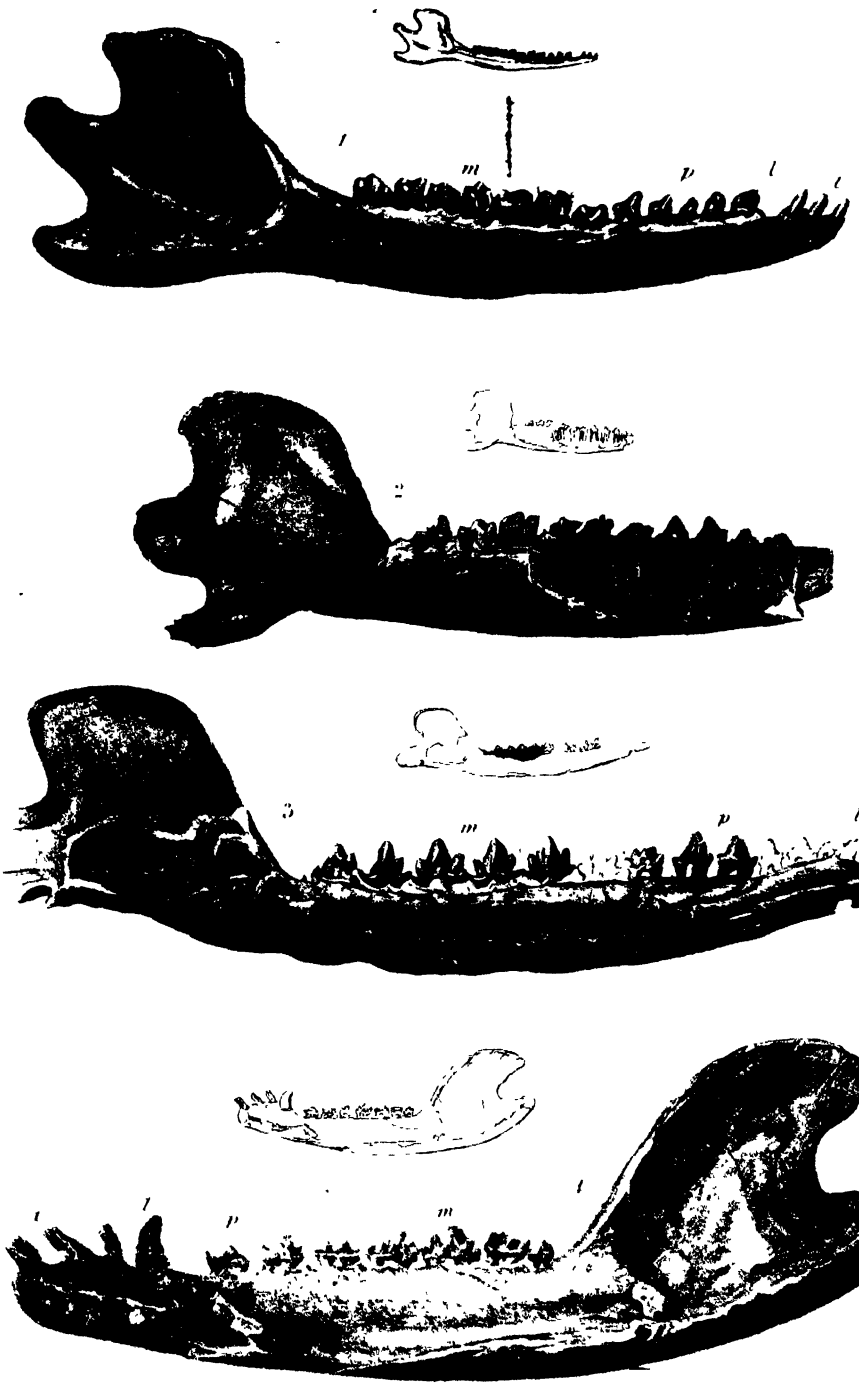
1_3, MANATEE.—4 5 TAPIR.—6 7 DINOTHERIUM



Lens Adams del. et lith.

Day & Haghe lith.rs to the Queen

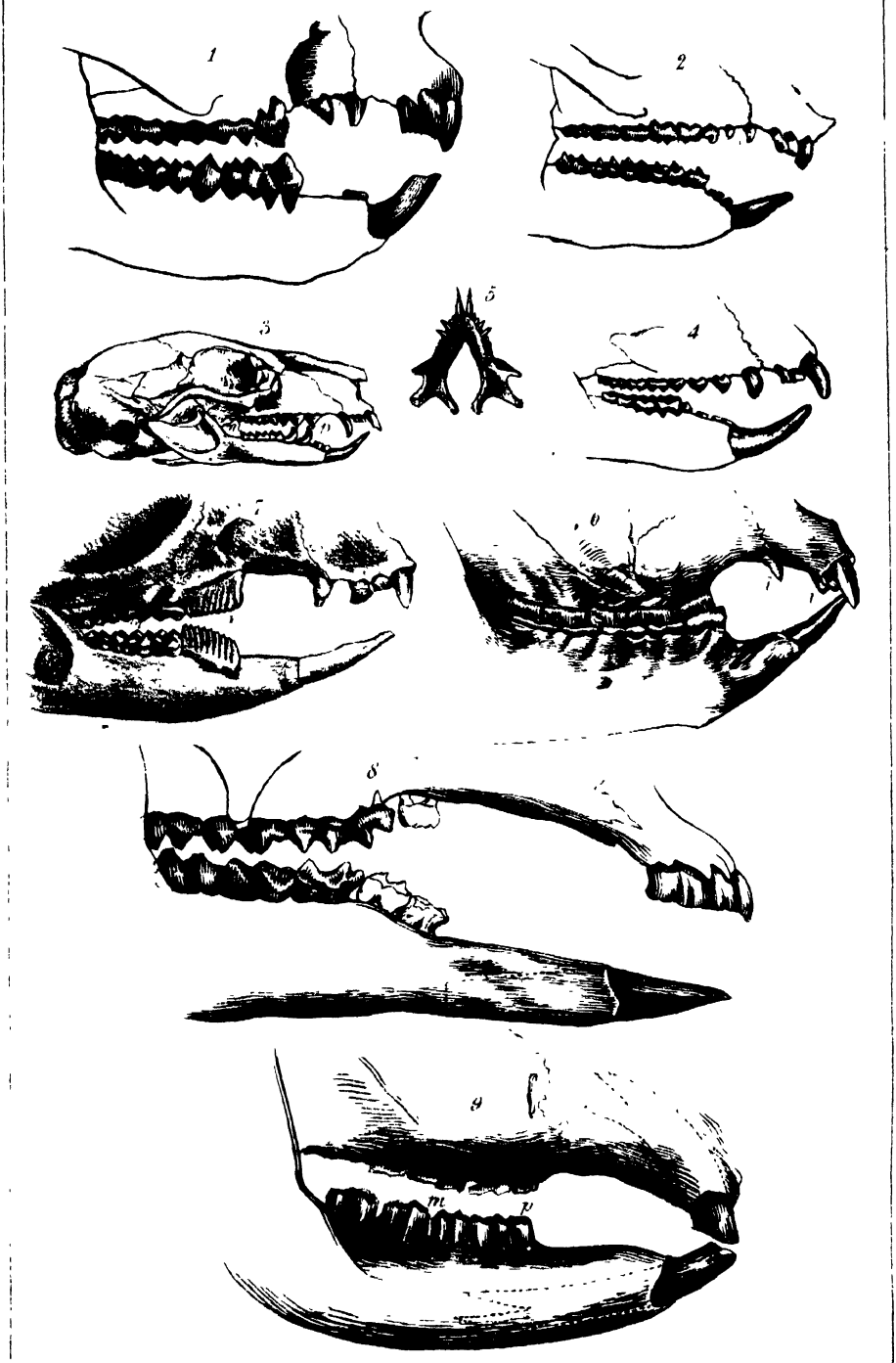
MARSUPIALIA.



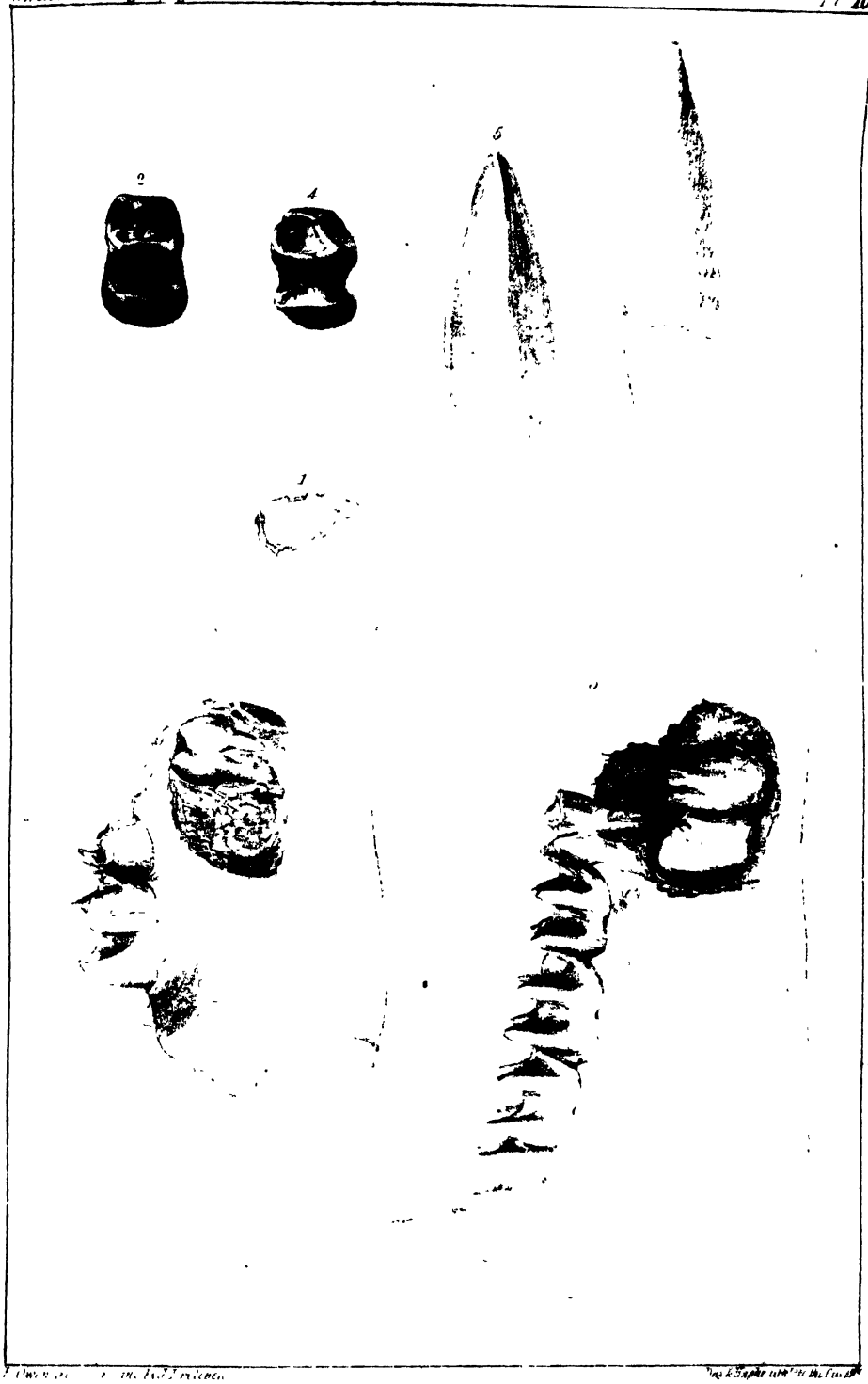
R. Owen del. On Stone by J. Erxleben. Day & Haghe lith. To the Queen.

1 3. AMPHITH PHASCOLOTHERIUM

the outlines give the Natural size

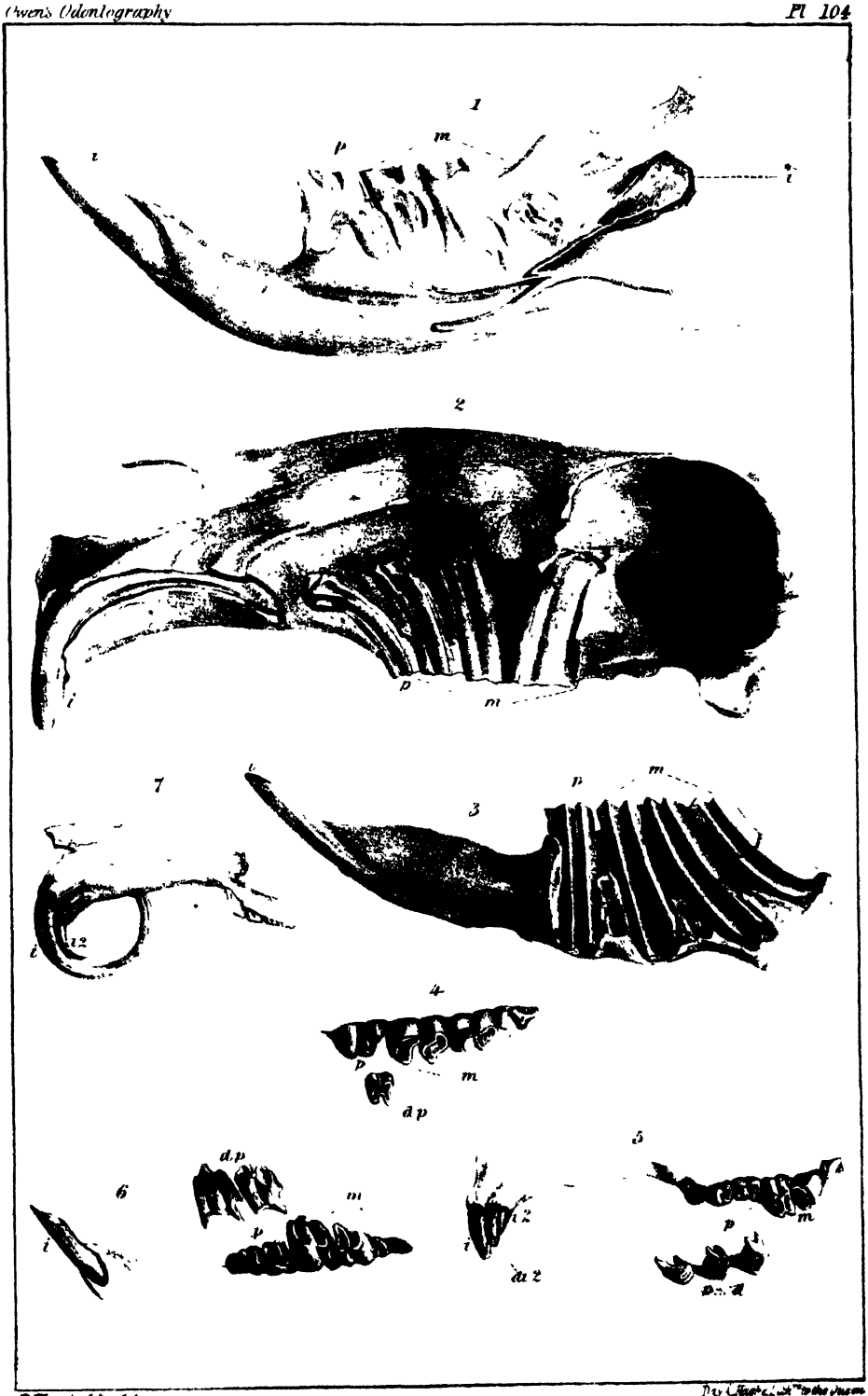


Day & Haghe lith^rs to the Queen



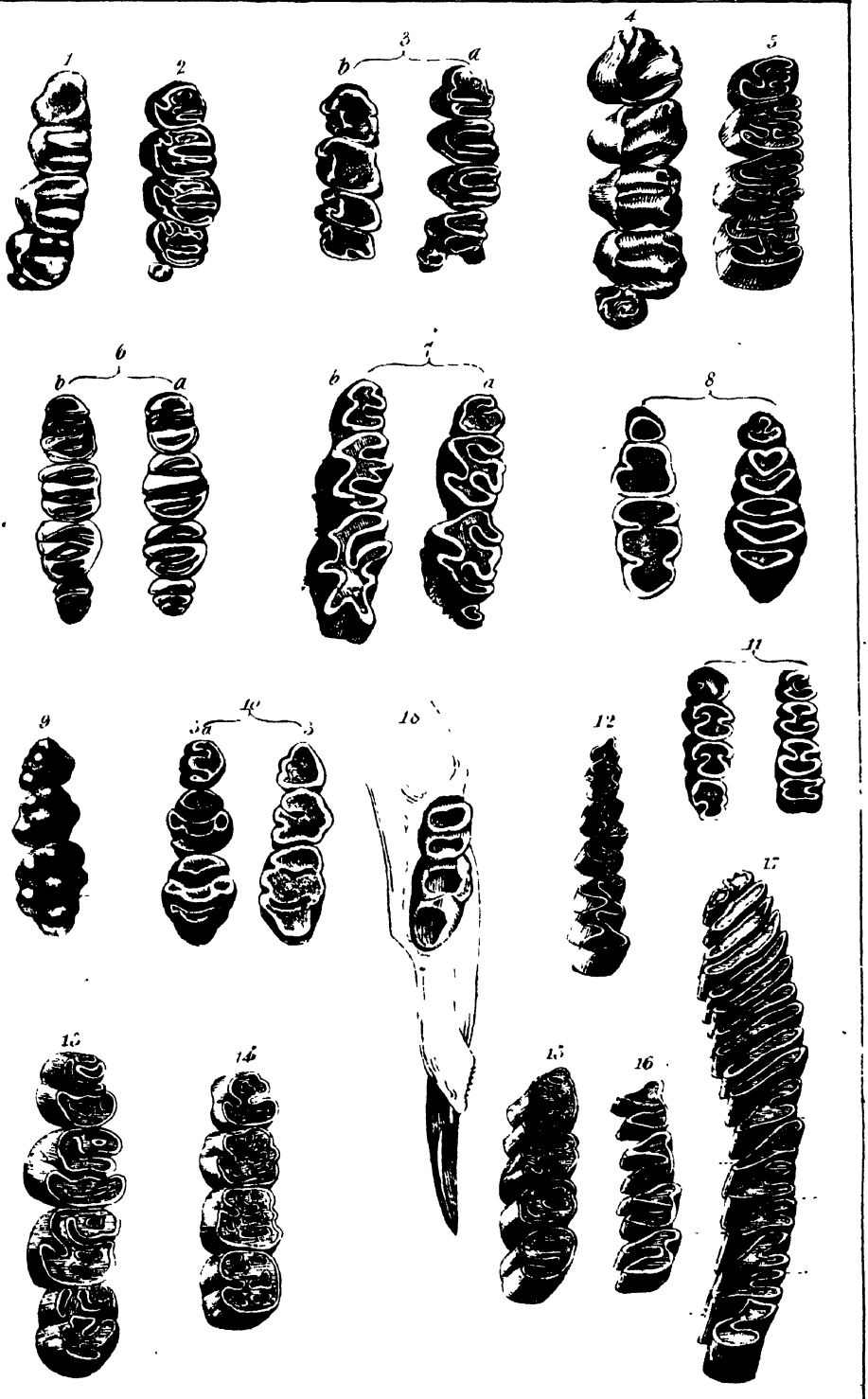
1 2. MACROPUS TITAN. 3 5 MACR ATLAS
Natural size





Printed by J. Appleton

RODENTIA



RODENTIA



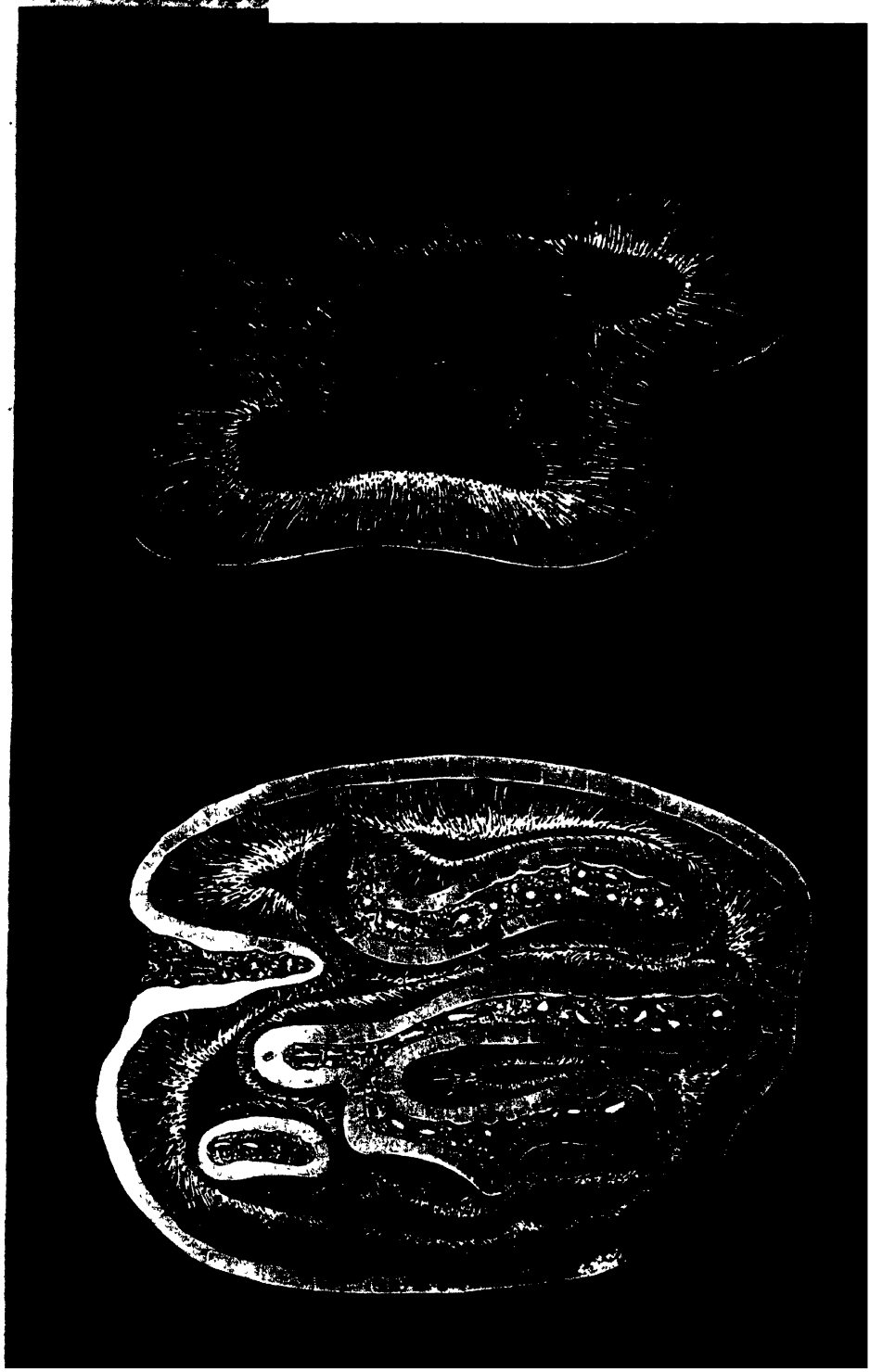
Printed by T. Aldous. Day & Haghe lith. to the Qu

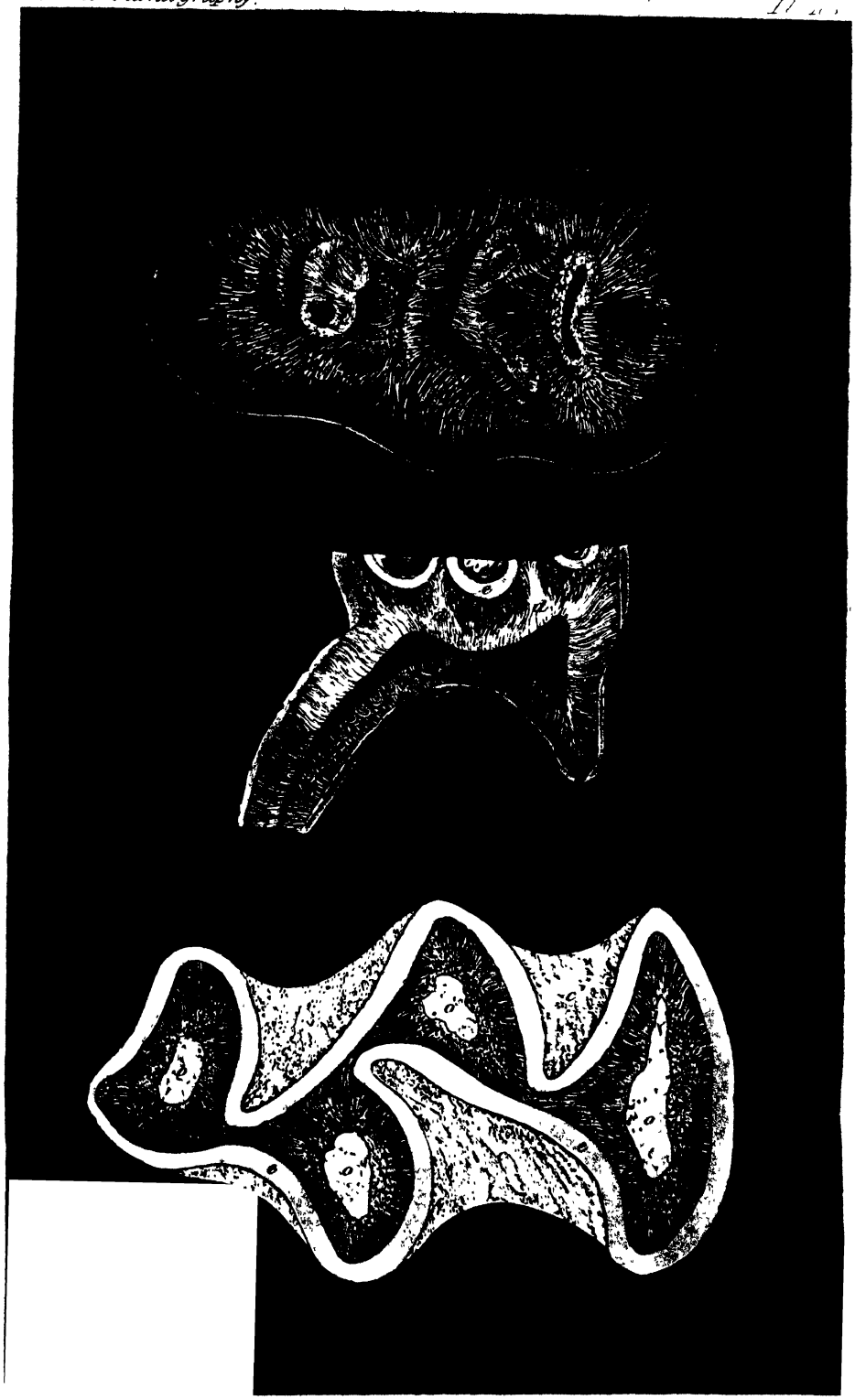
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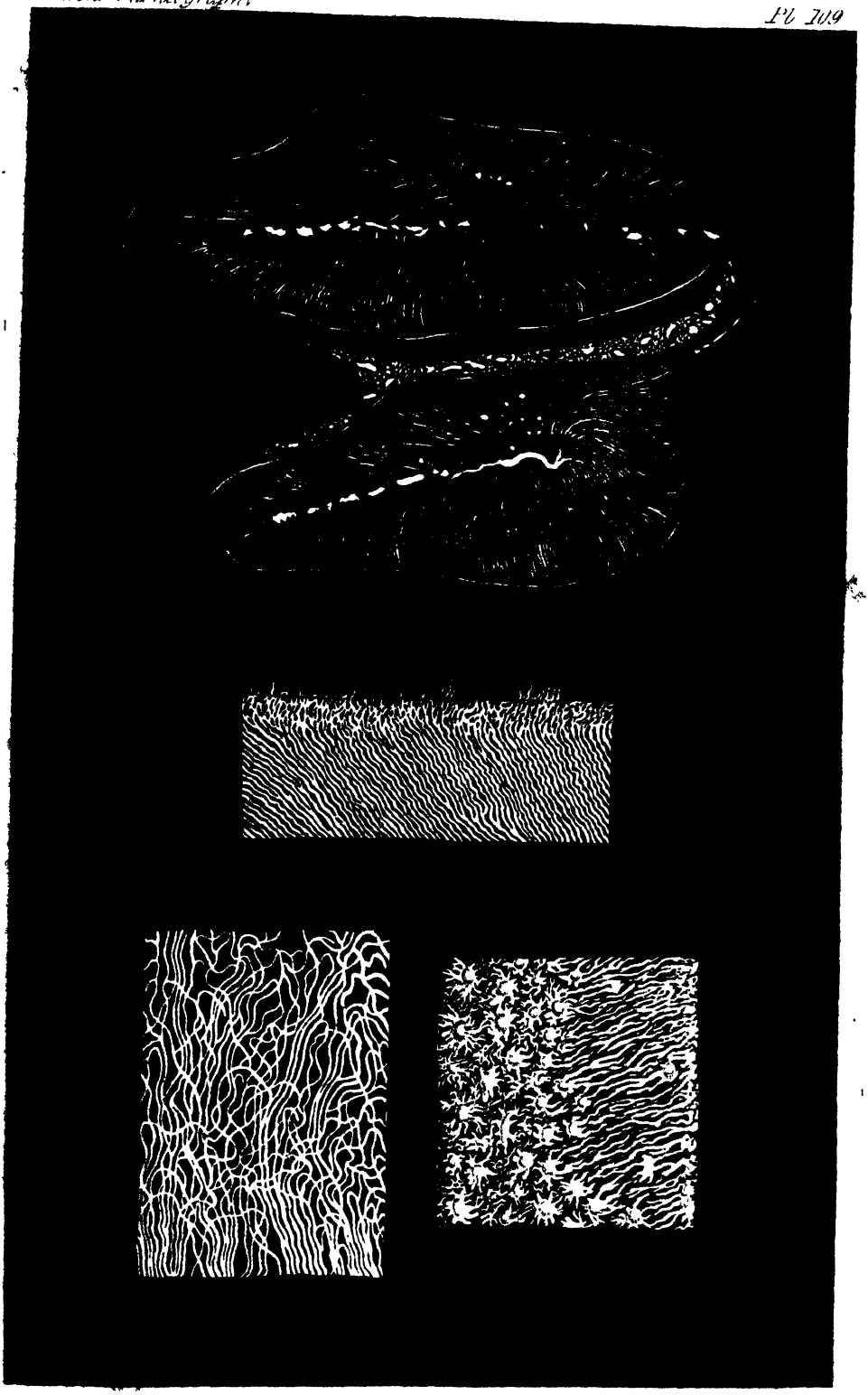
⅓ Natural size

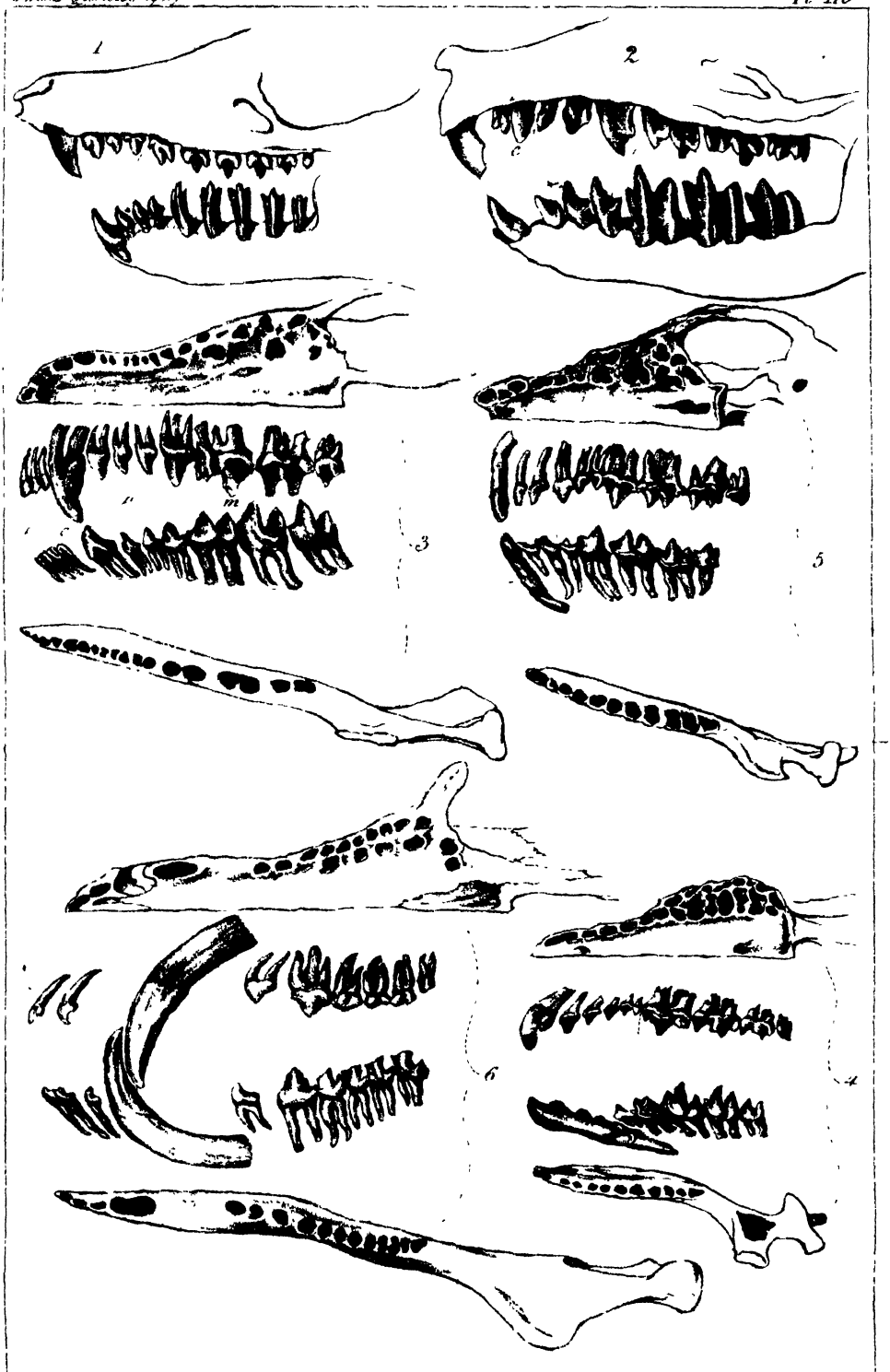
Published by J. Van Voorst, 1840

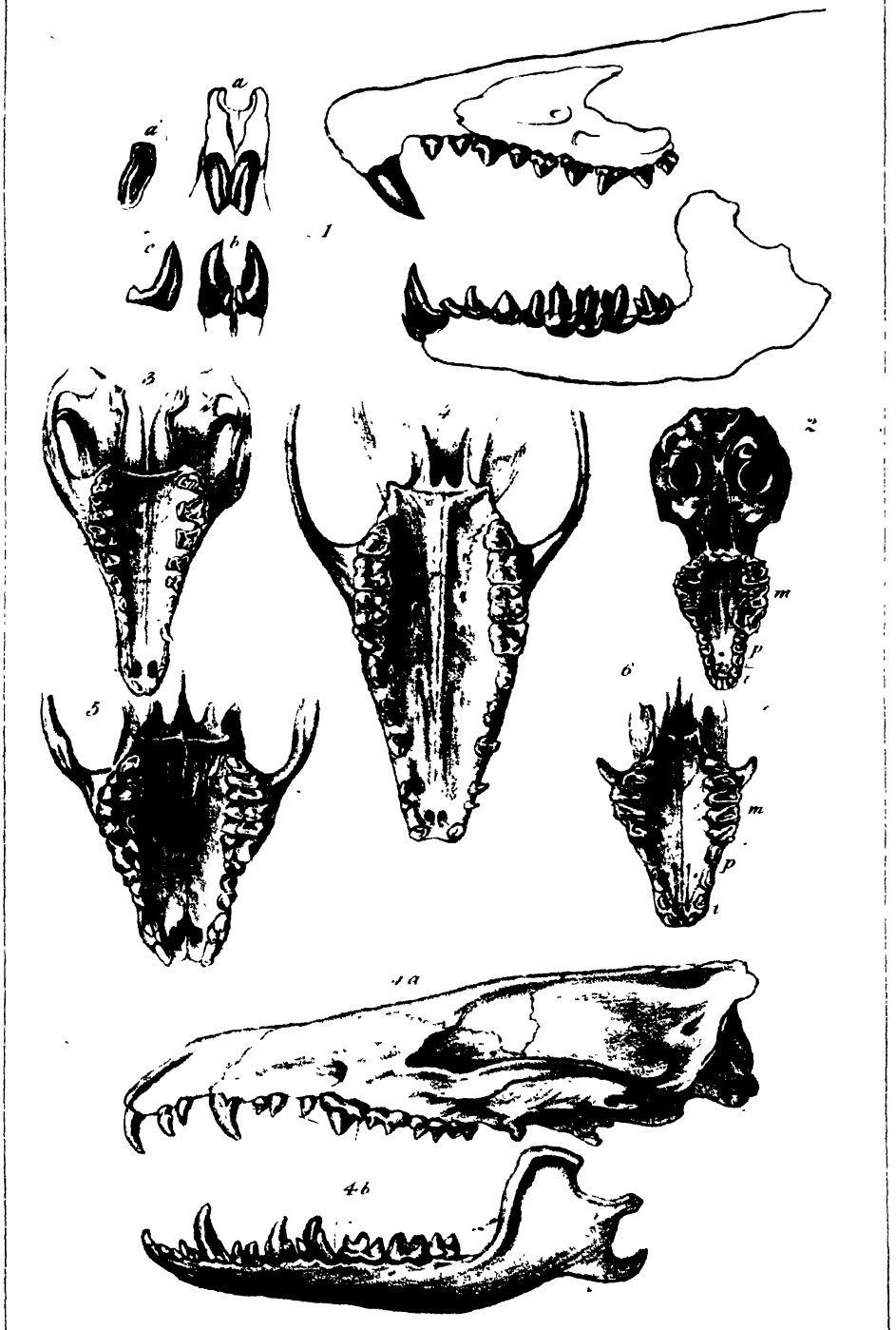
Owen's Odontography








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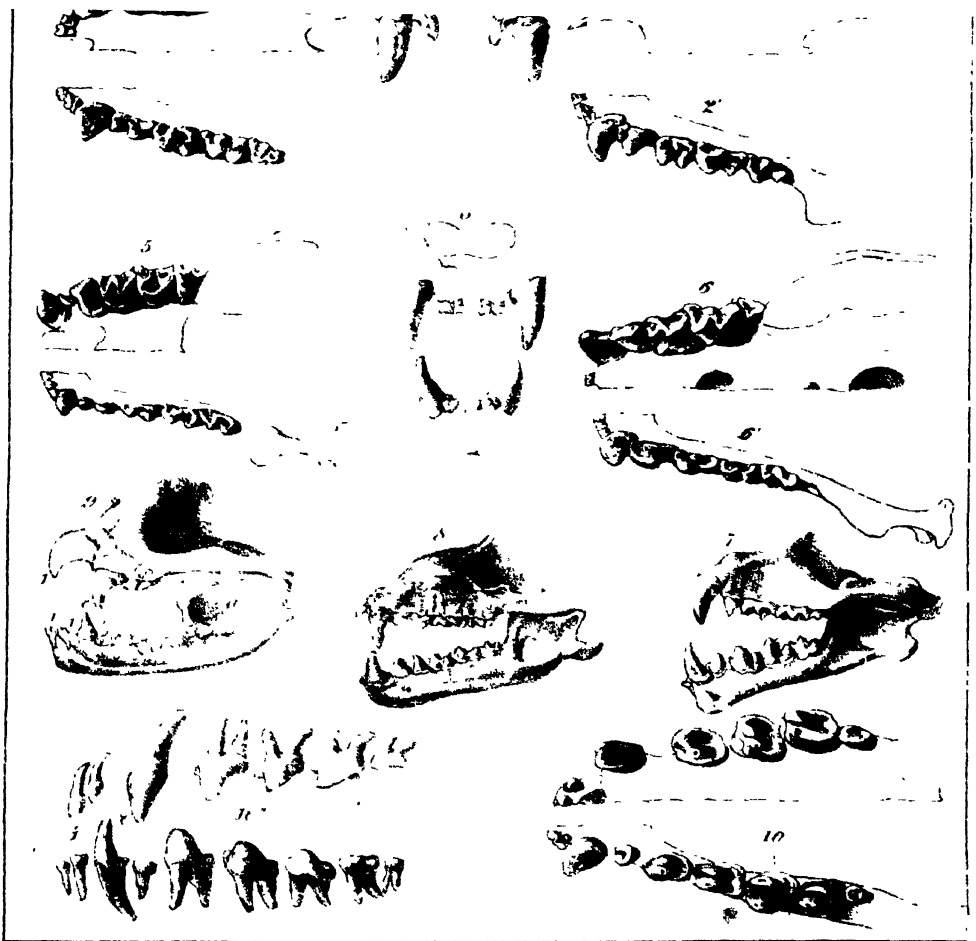


R. Owen: del. — On Zinc by T. Aldous

Day & Haghe lith.rs to the Queen

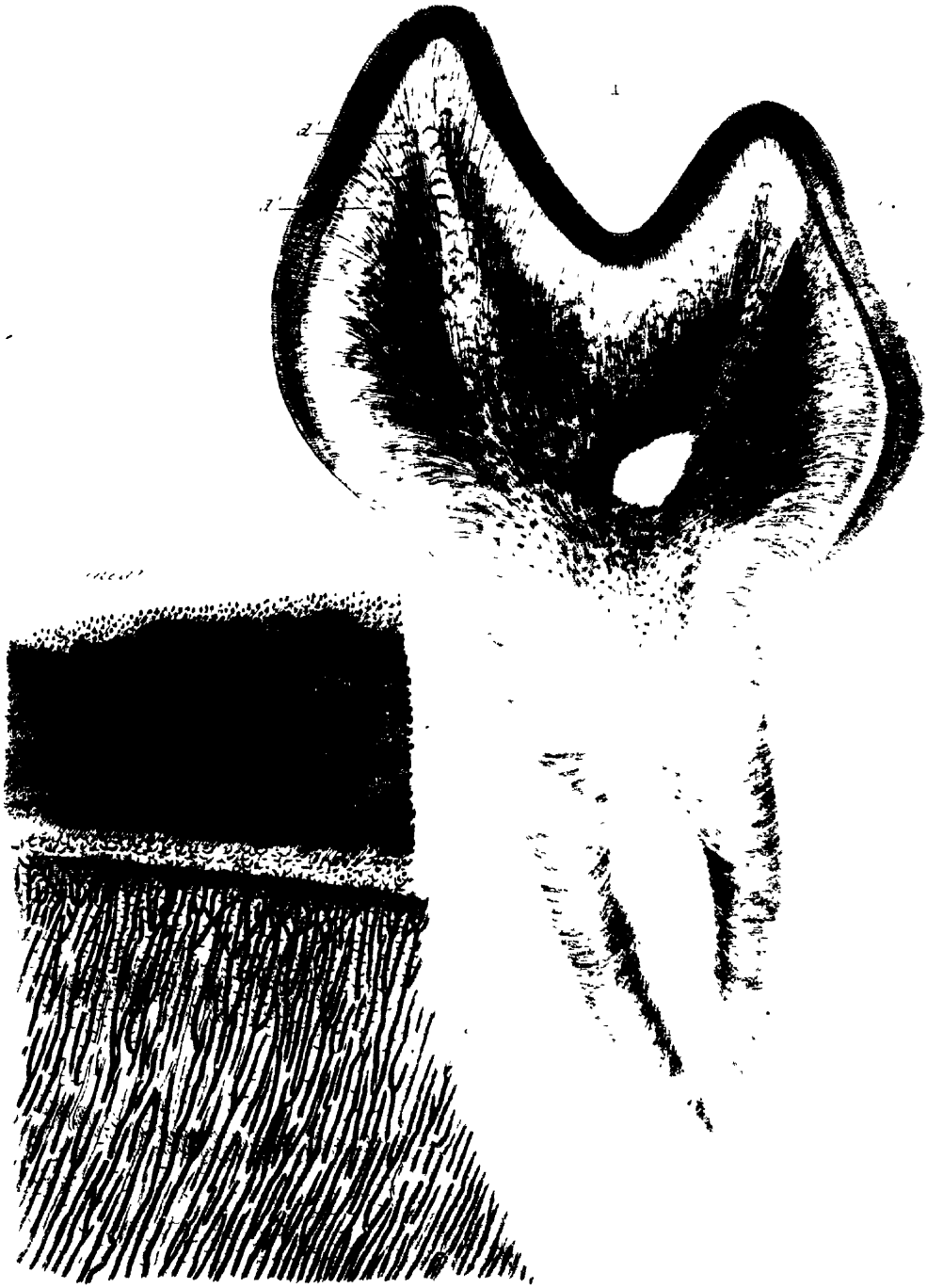
INSECTIVORA

London. Published by H. Bailliere. 1841

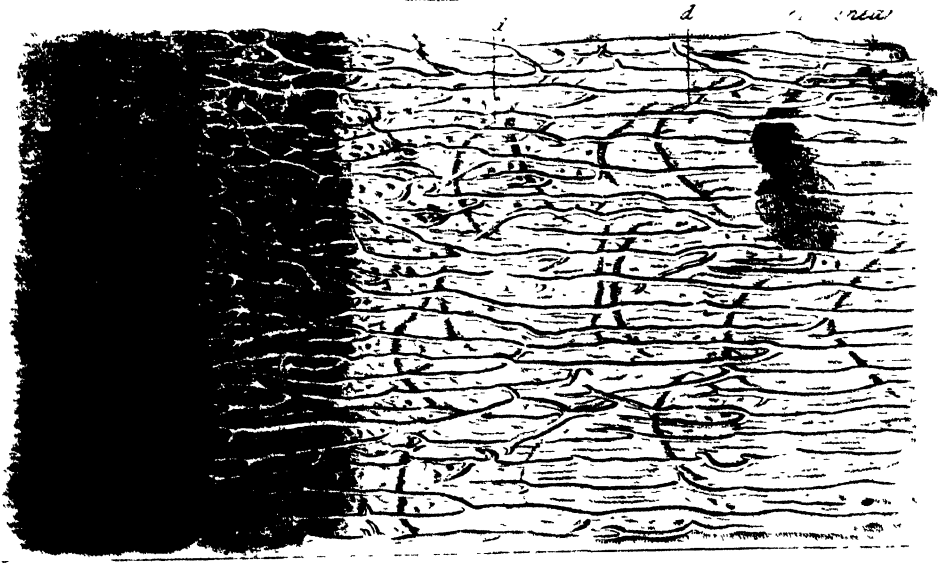


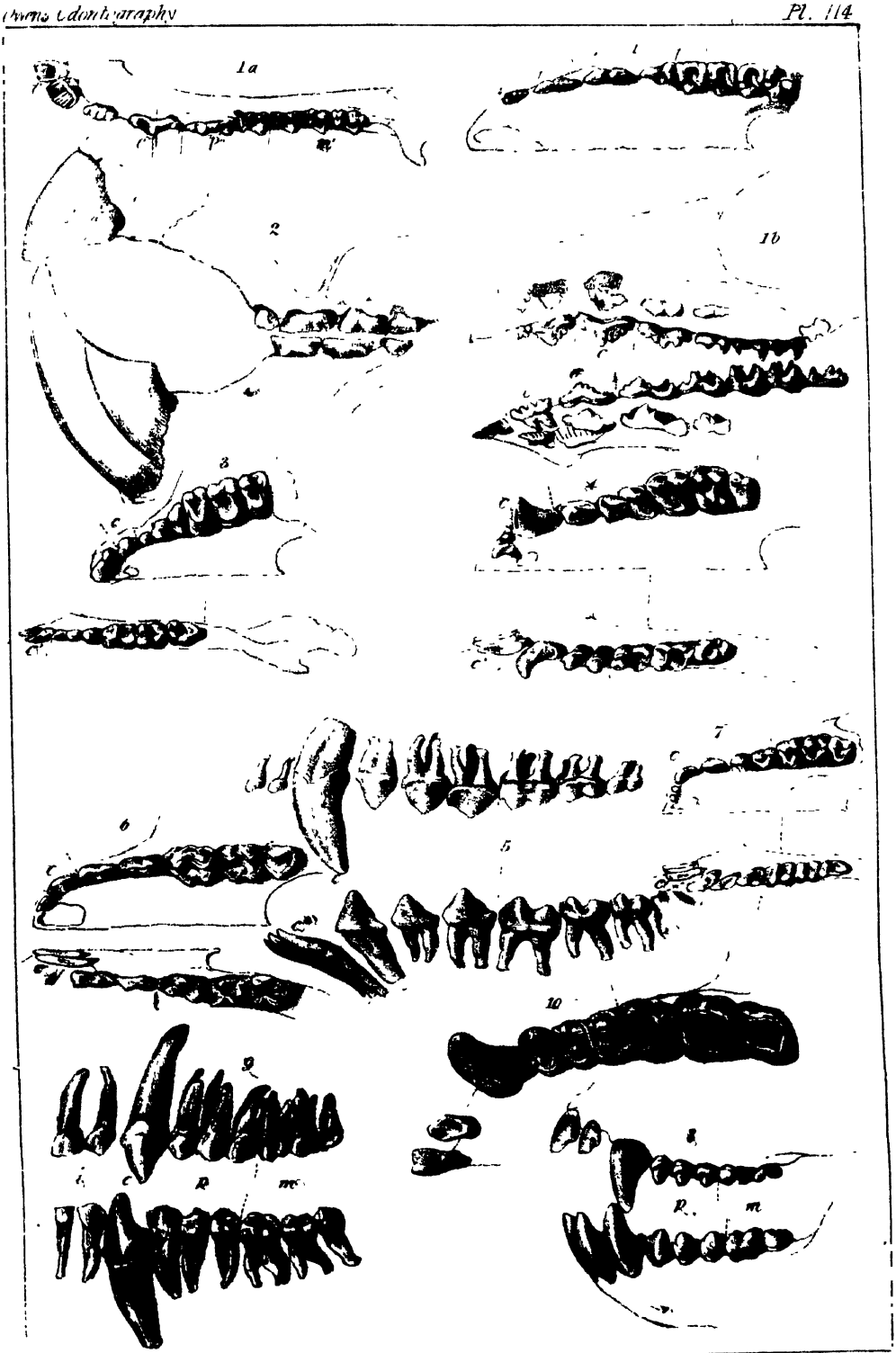
Werner del. J. Erxleben fec.

Mus. Lugdun. Lith. Technicum

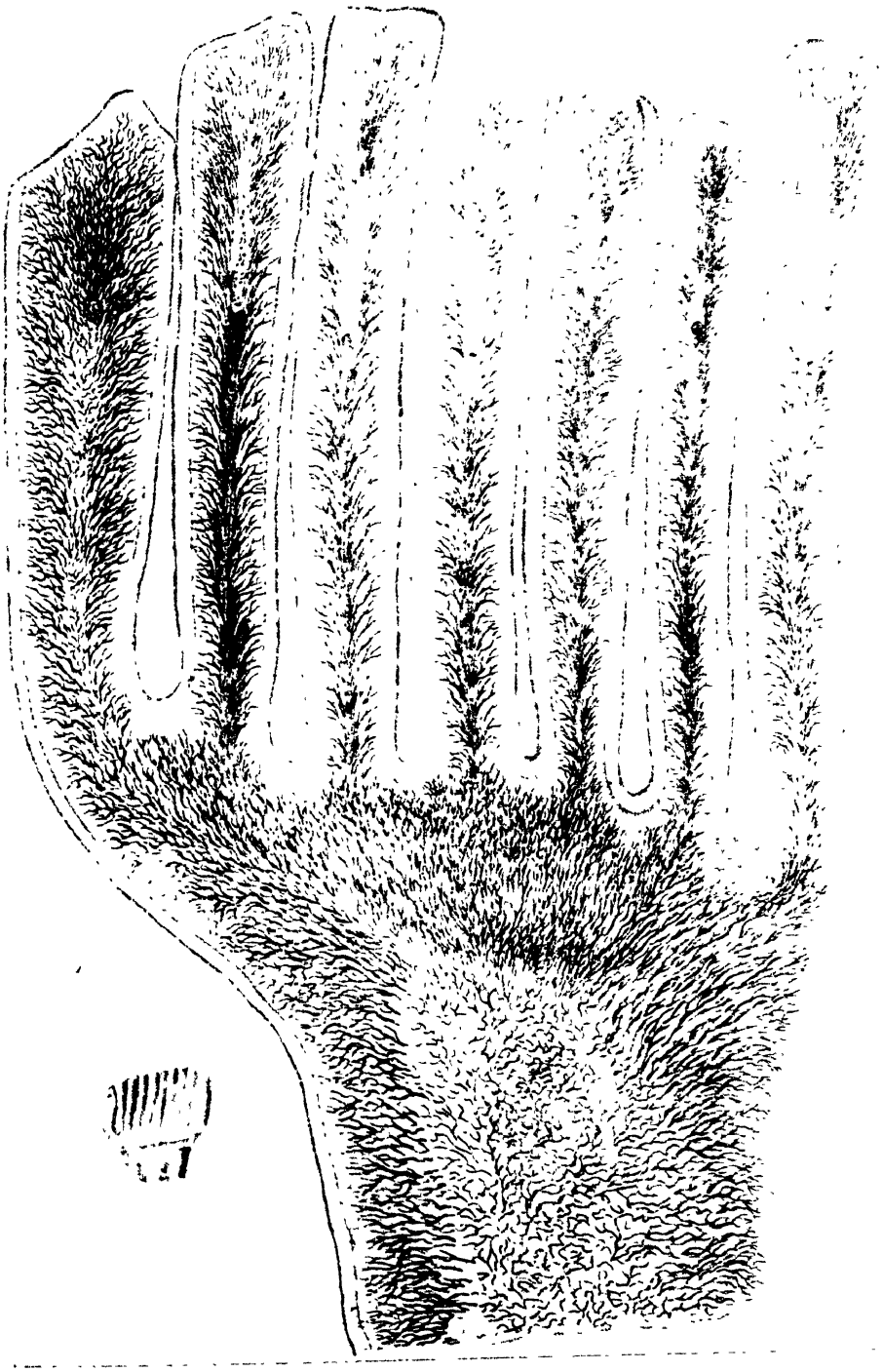




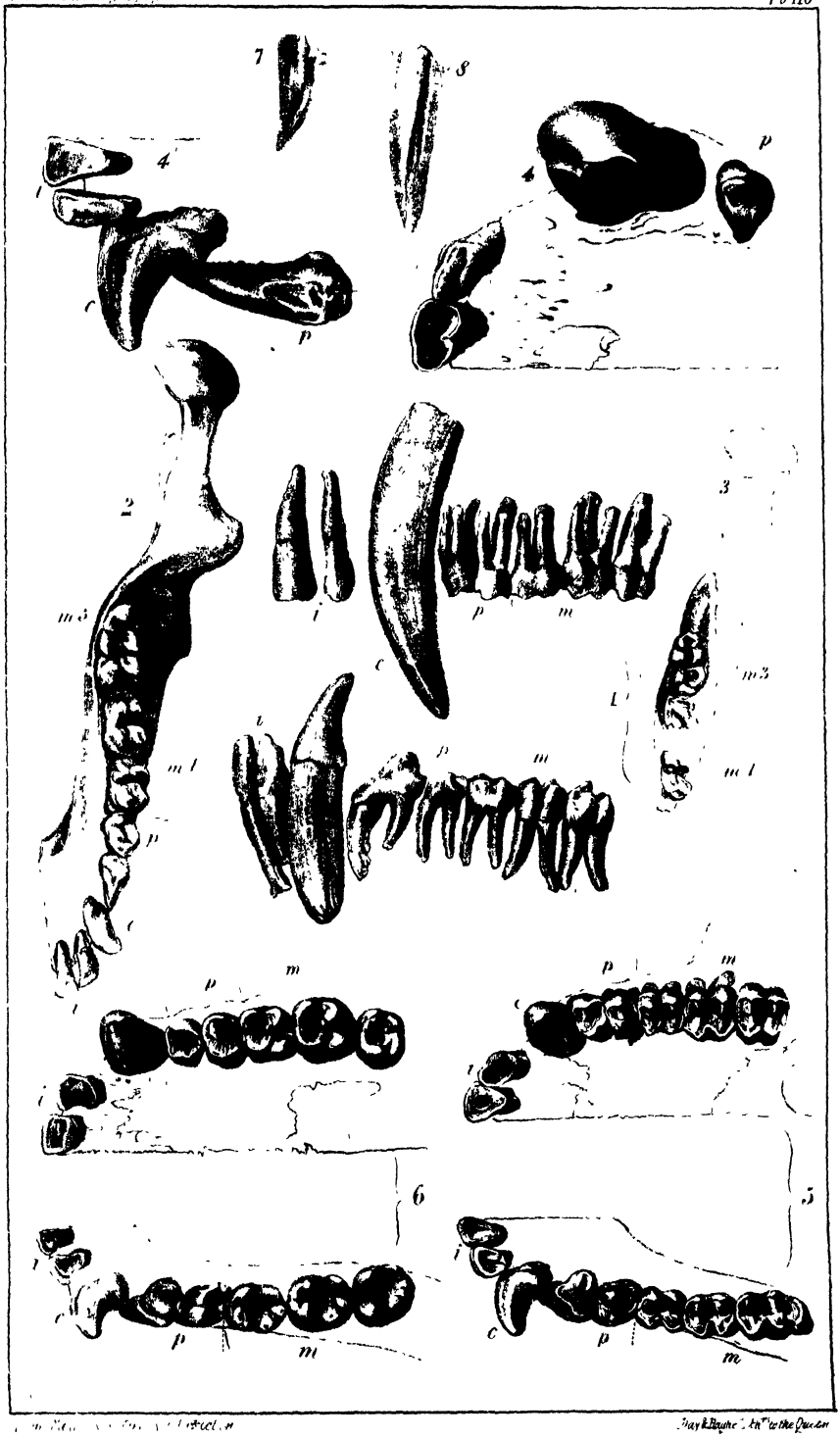




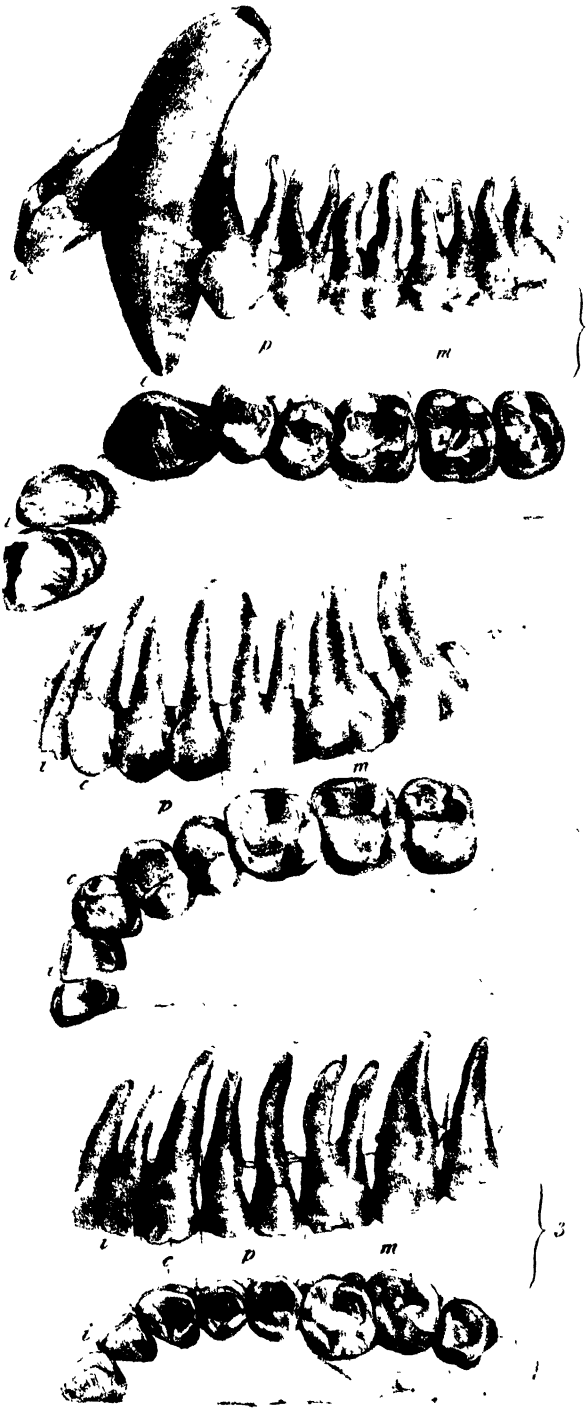
QUADRUMANA



Jos. Dinkel, del. INCISOR OF GALEOPITHECUS J. Shury & Son. sculp.



QUADRUMANA



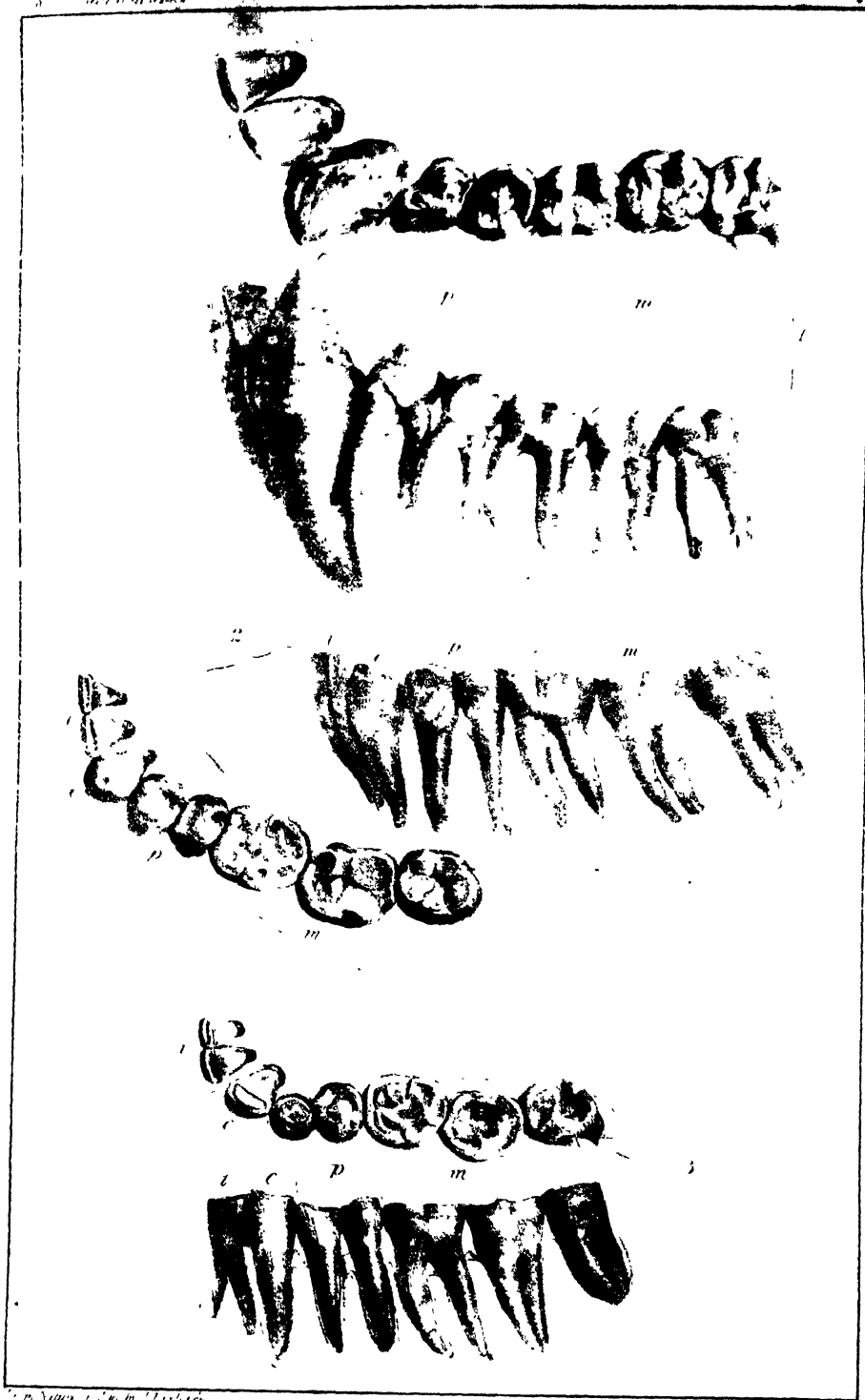
From Nature on Stone by F. Edw. Tatebon

Day & Haghe with Pr to the Queen

UPPER JAW

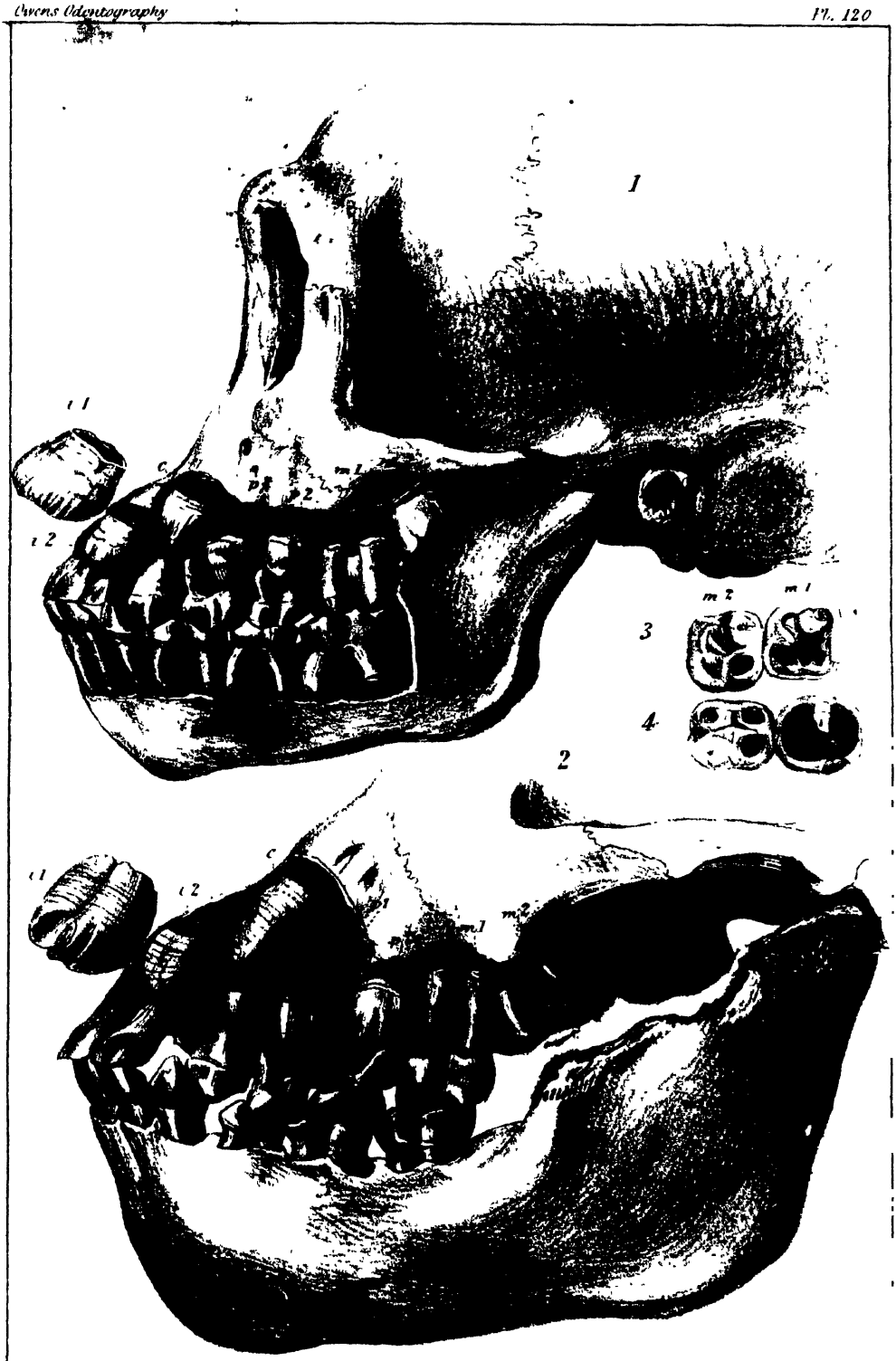
1. Chimpansee 2. Australian 3. European

Printed by H. Baillière 1845



LOWER JAW

1. Chimpanzee 2. Australian 3. European

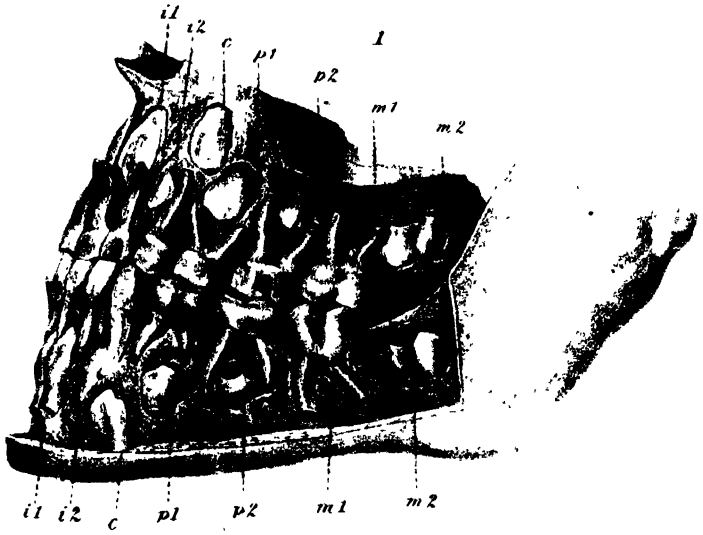


On Stone by T. Sexteshon

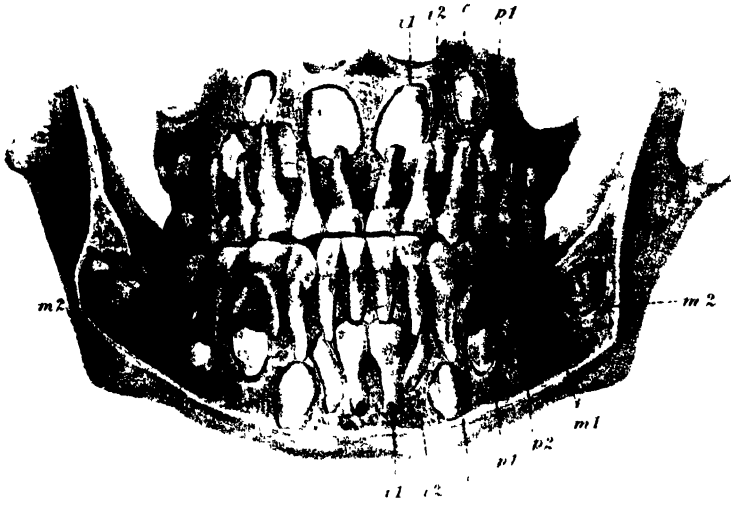
Day & Haghe Lith^rs to the Queen

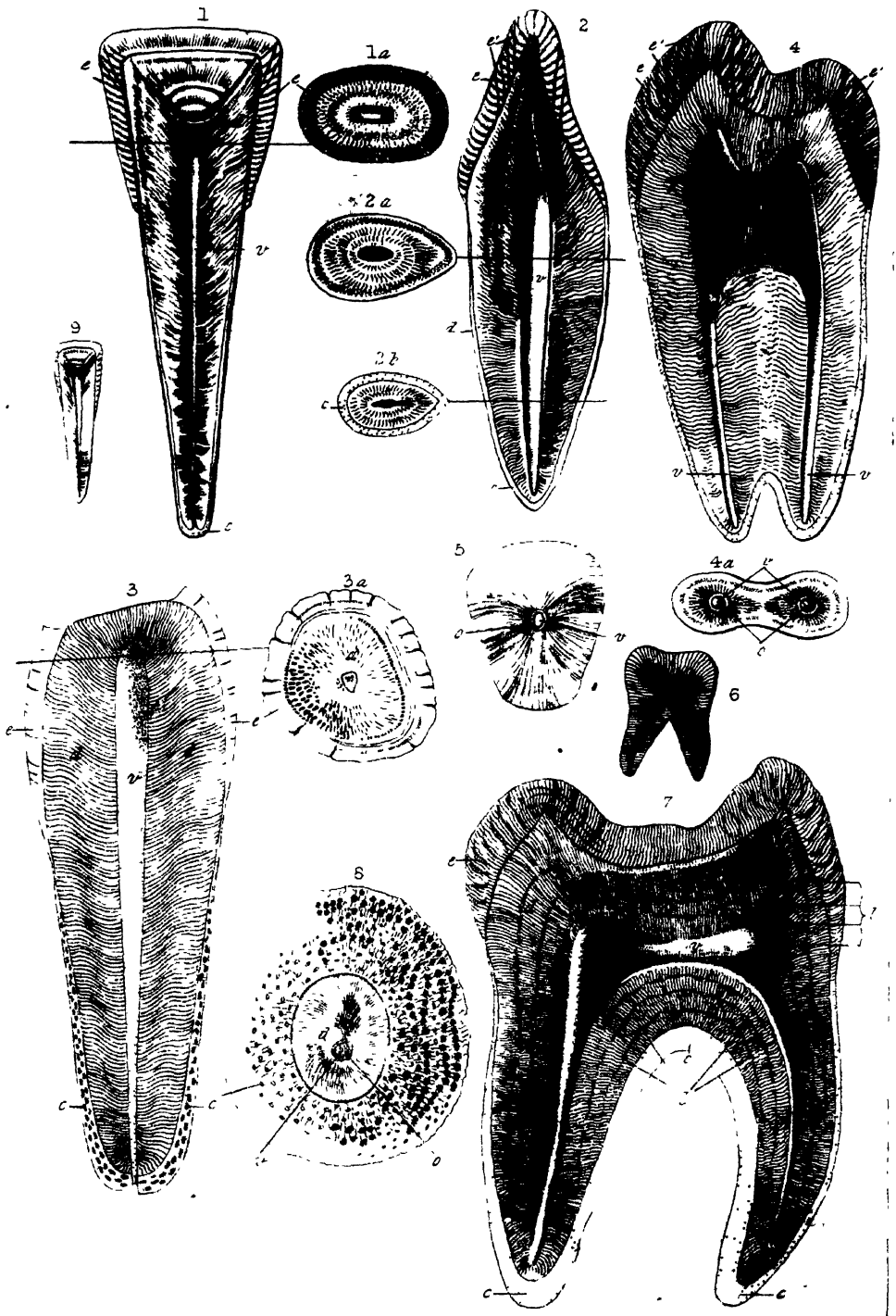
DECIDUOUS AND PERMANENT TEETH.

1

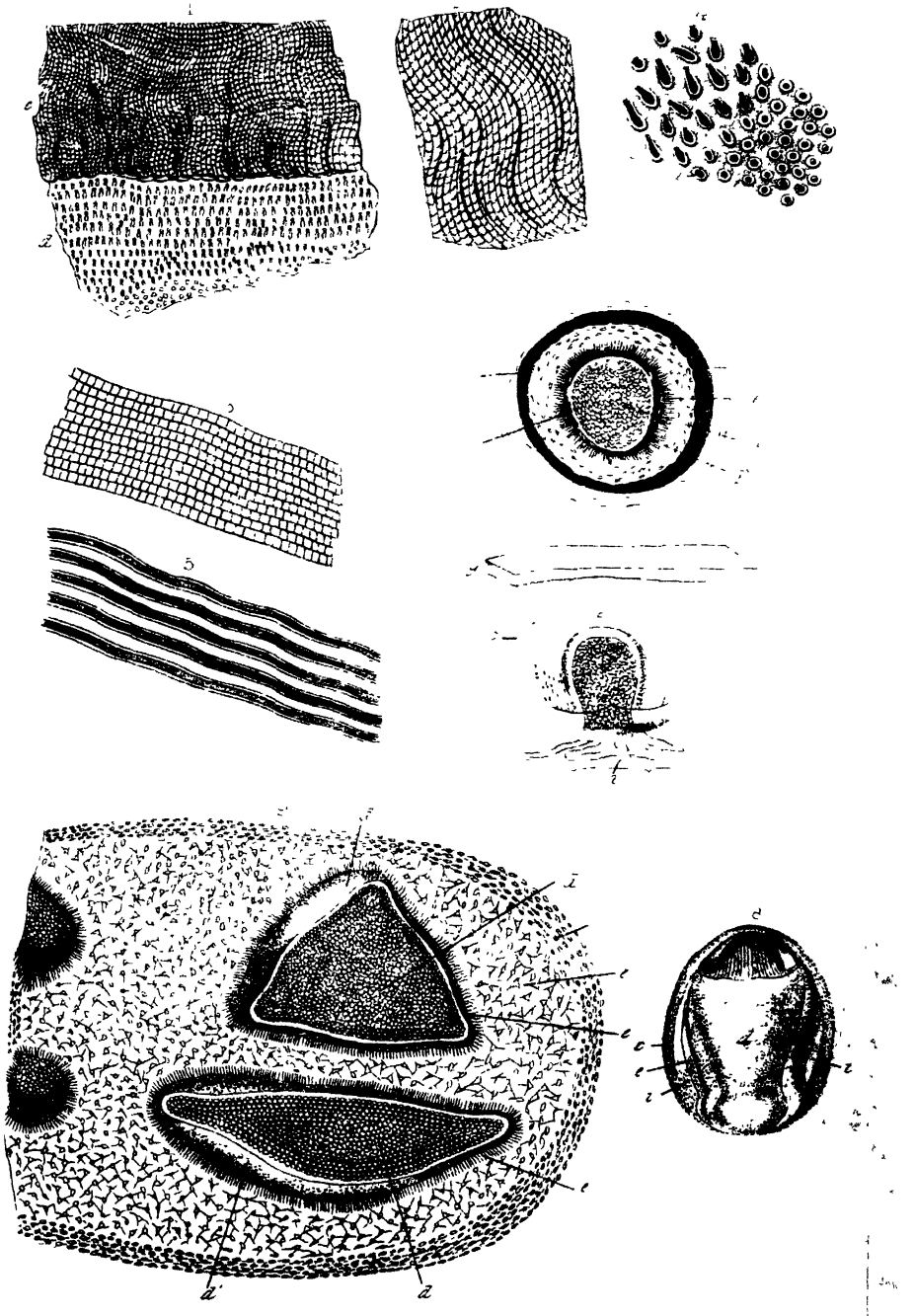


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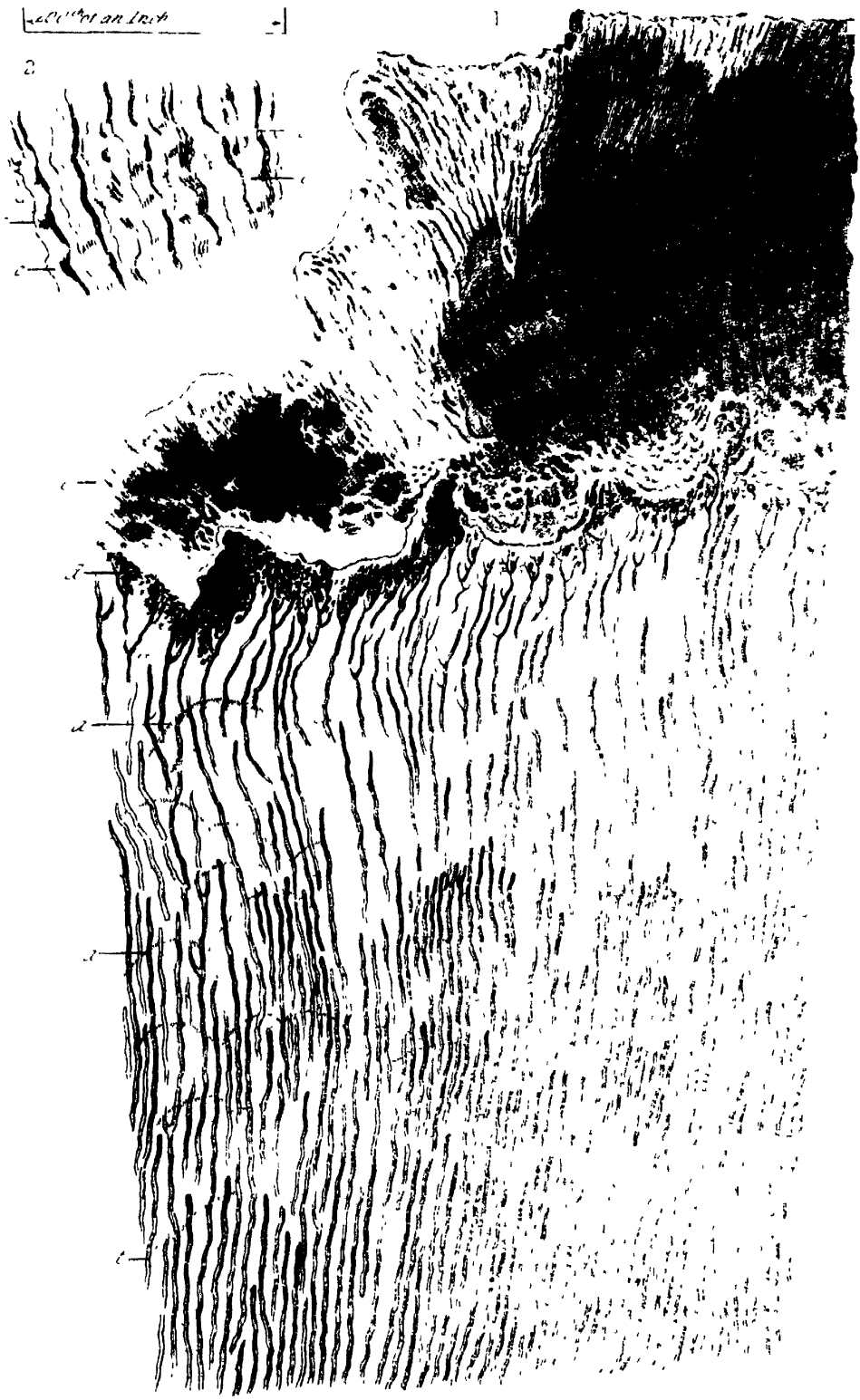


STRUCTURE OF HUMAN TEETH



STRUCTURE & DEVELOPMENT OF TEETH

Jos Dinkel del







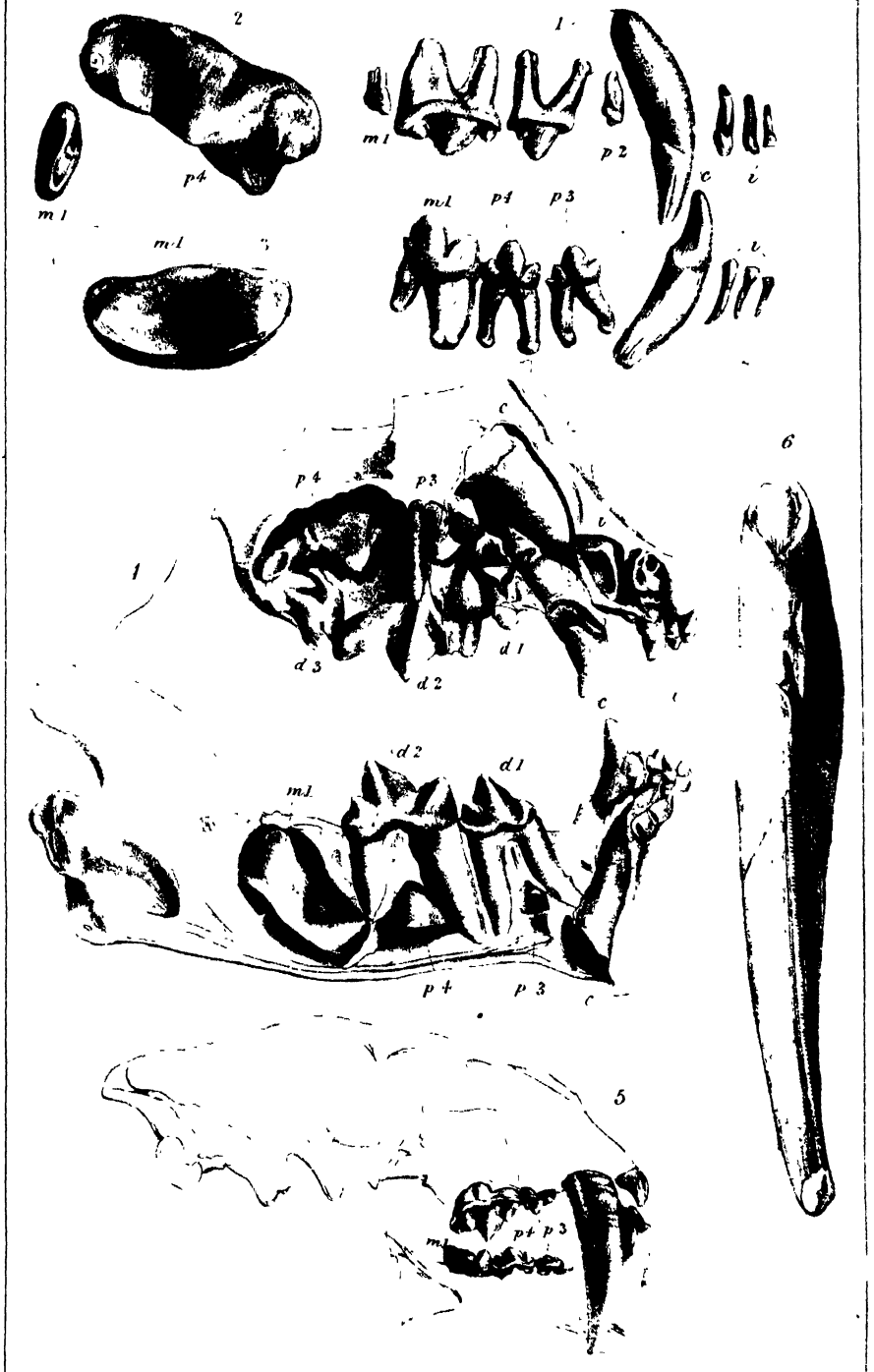
Werner del. et Lithog. by J. Erxleben Day & Haghe Lith^rs to the Queen

1 4 CANIS 5. MEGALOTIS 6. PROTELES.

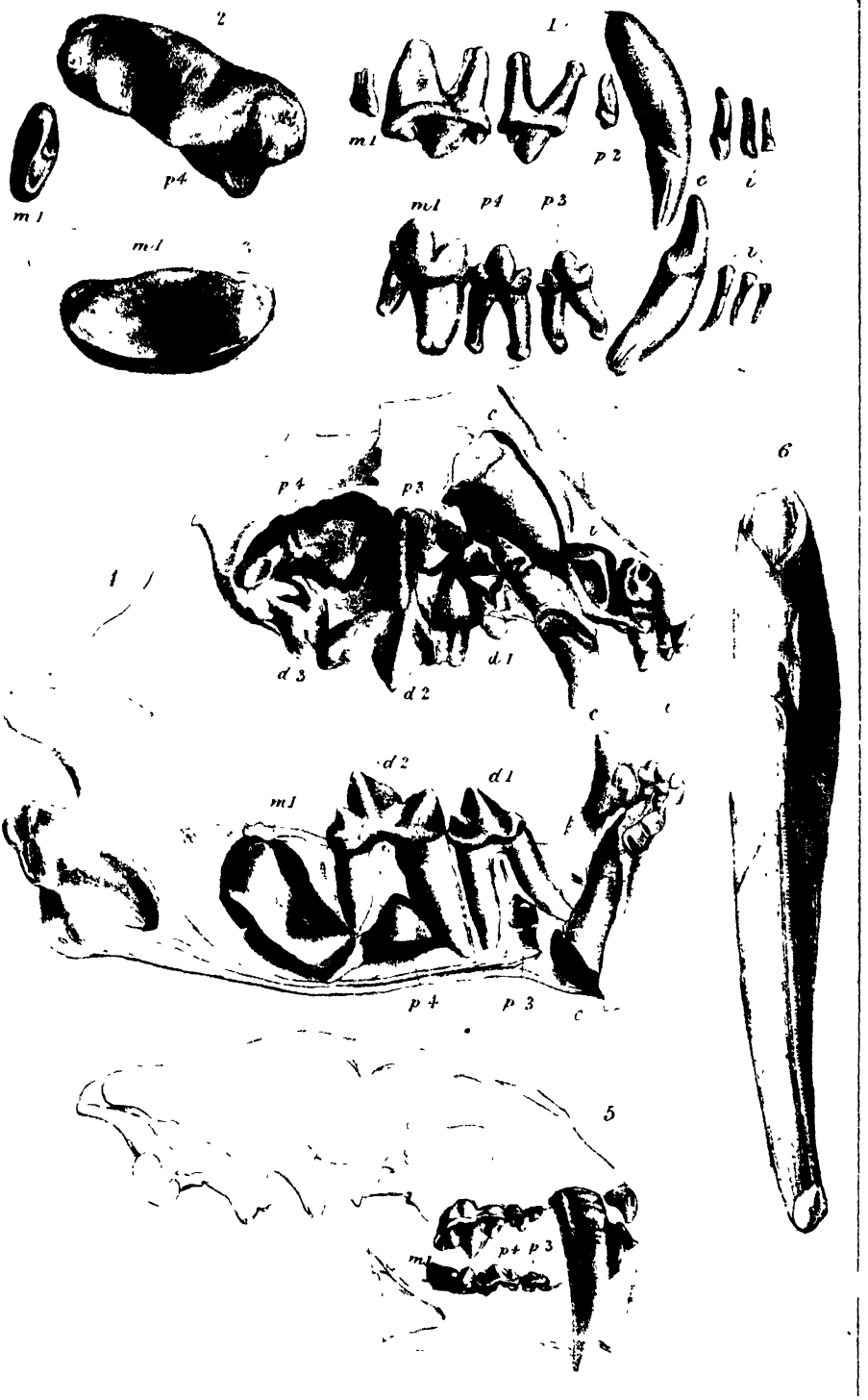


Werner del. on Timothy Thrxleben

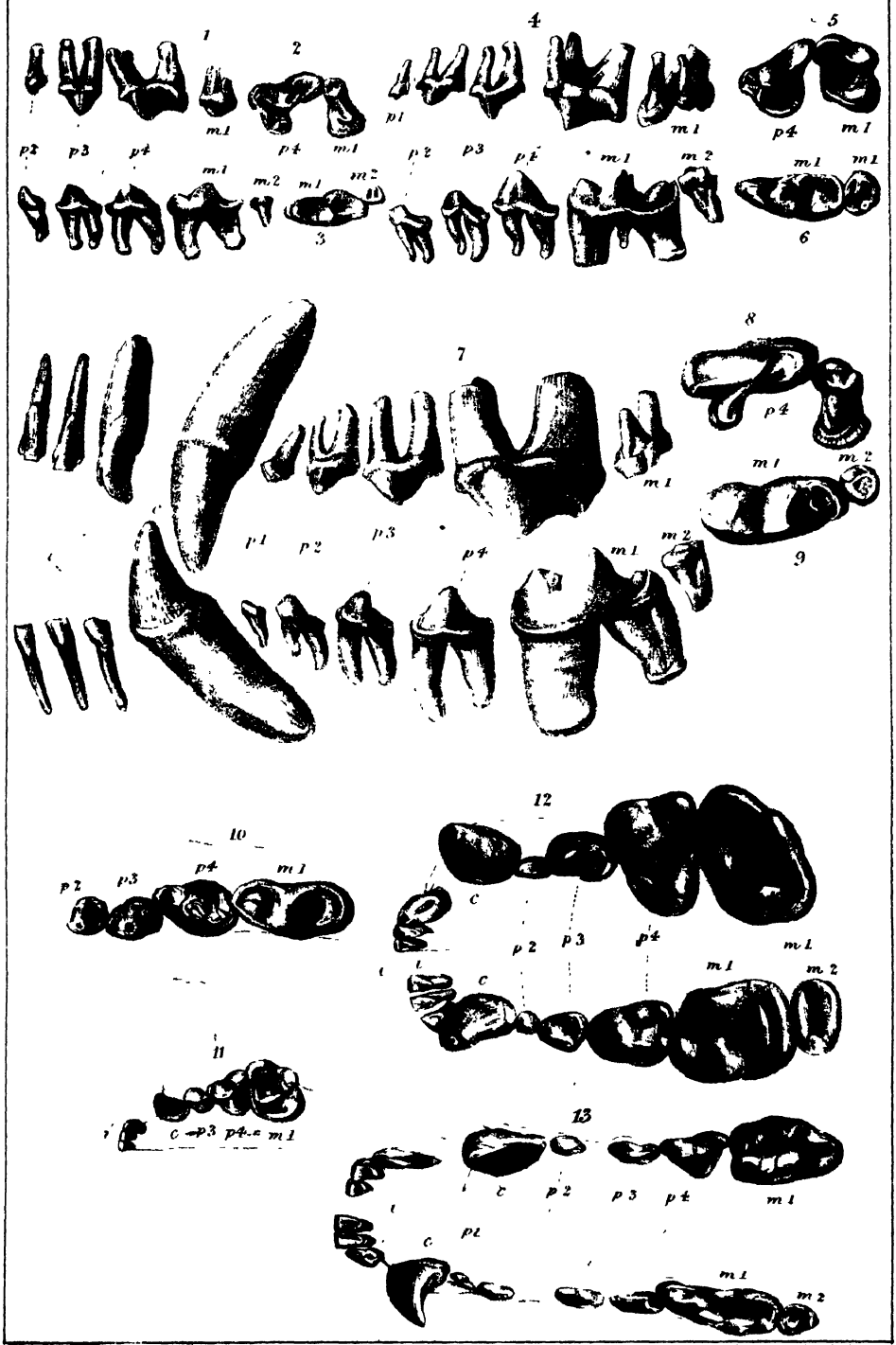
1–5 VIVERRA. 6–9 HYENA.


2
1
m 1
p 4
m 1
m 1
p 2
c
i
m 1
p 4
p 3
v
c
6
p 4
p 3
v
1
d 3
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c
d 2
d 1
m 1
f
p 4
p 3
c
5
p 4
p 3
m 1

PLATE

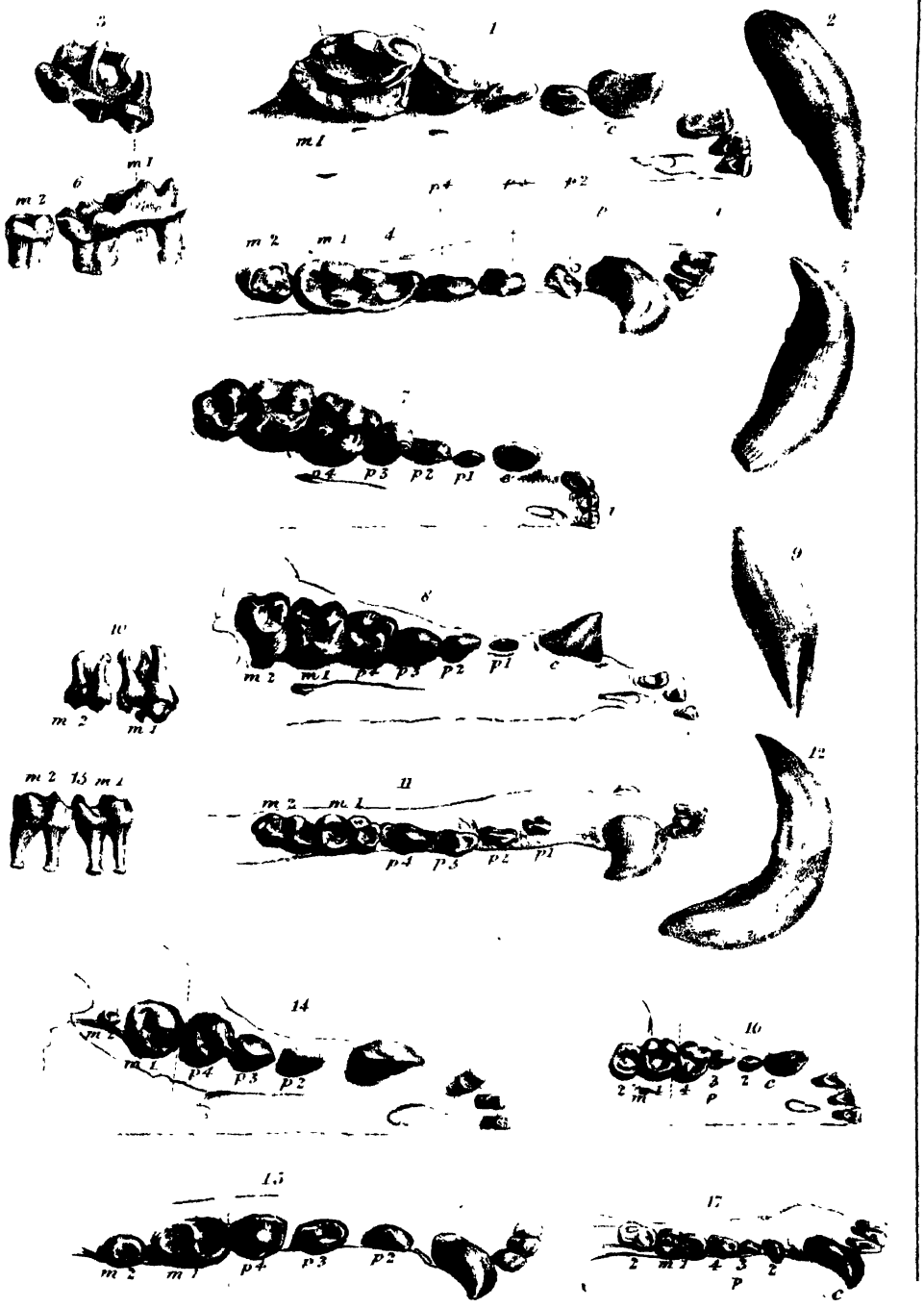

2
p4
m1
1
m1
p2
c
i
m1 p4 p3
v
m1
3
p4
p3
c
i
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d3
d2
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6
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p4 p3
m1

PSEUDA



MUSTELIDÆ

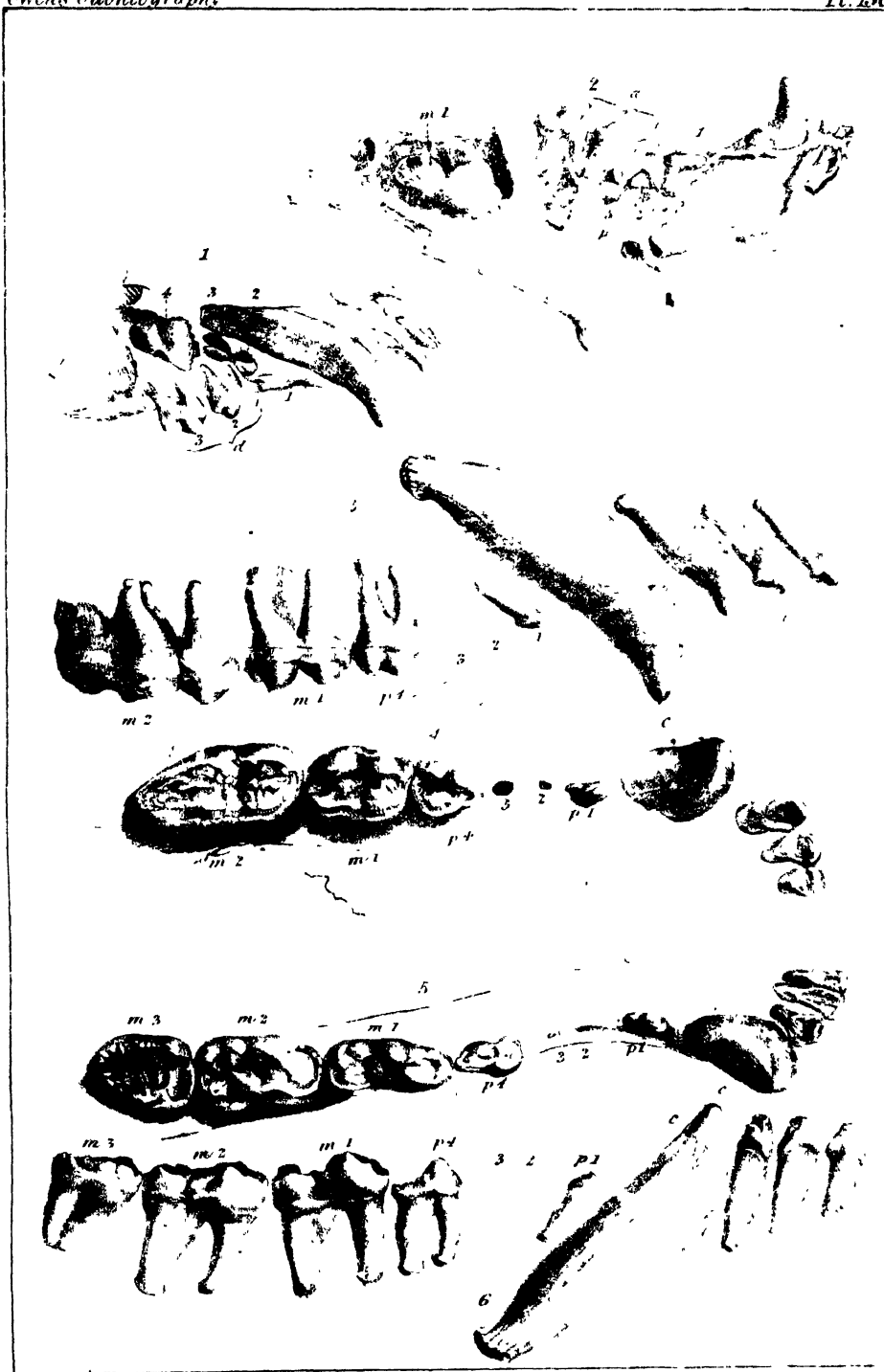
London, Published by H. Baillière 1845



Werner del. et Transfer. Day & Haghe lith.rs to the Queen

1 6. MELES — 7. PROCYON. — 8-13. NASUA — 14, 15. ARCTICTIS
16, 17. CERCOLEPTES

Published by H. Baillière 1844



Werner del. et Lith. Dresden, 1846

URSUS

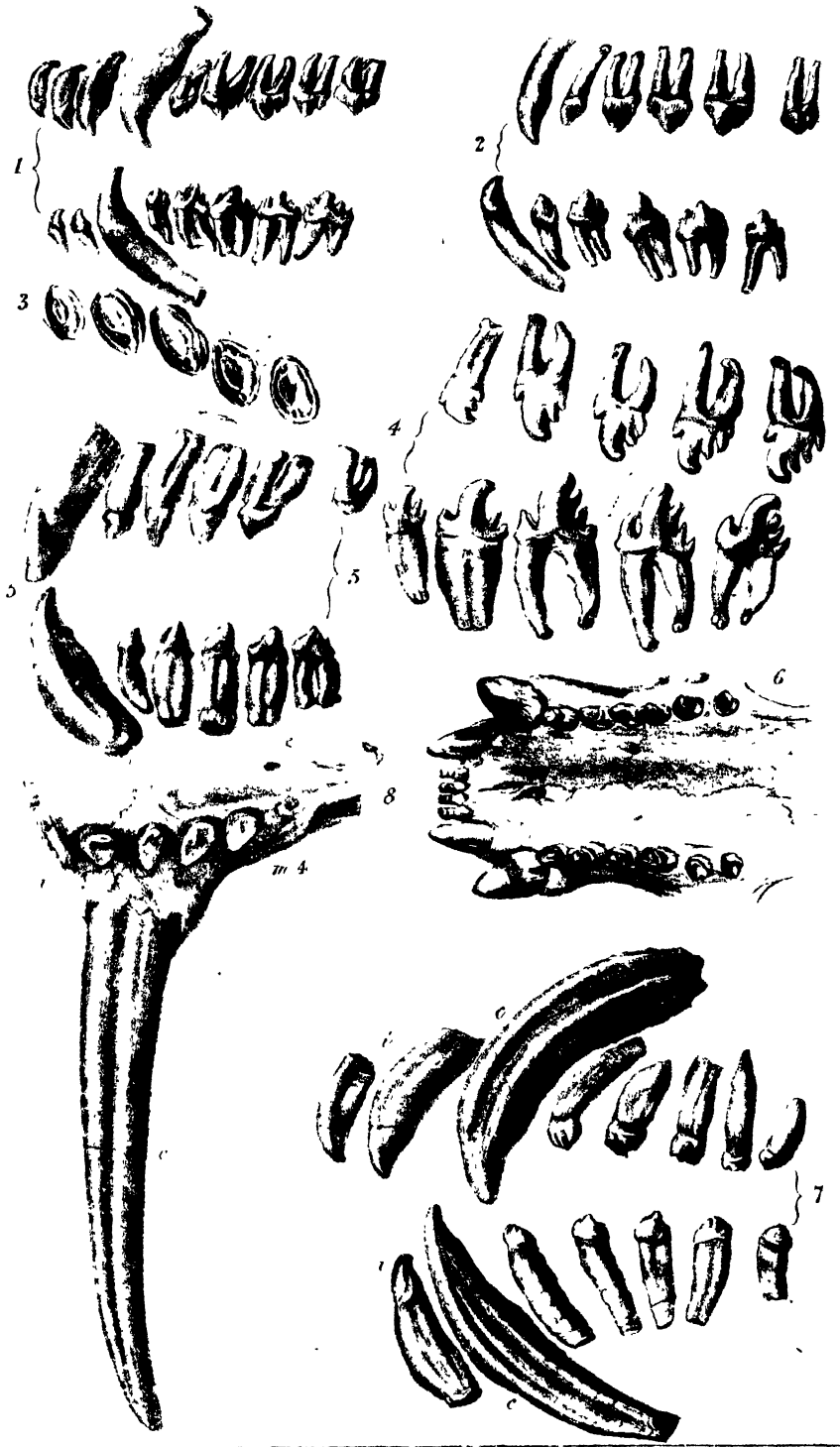
London Published by H. Baillière, 1846



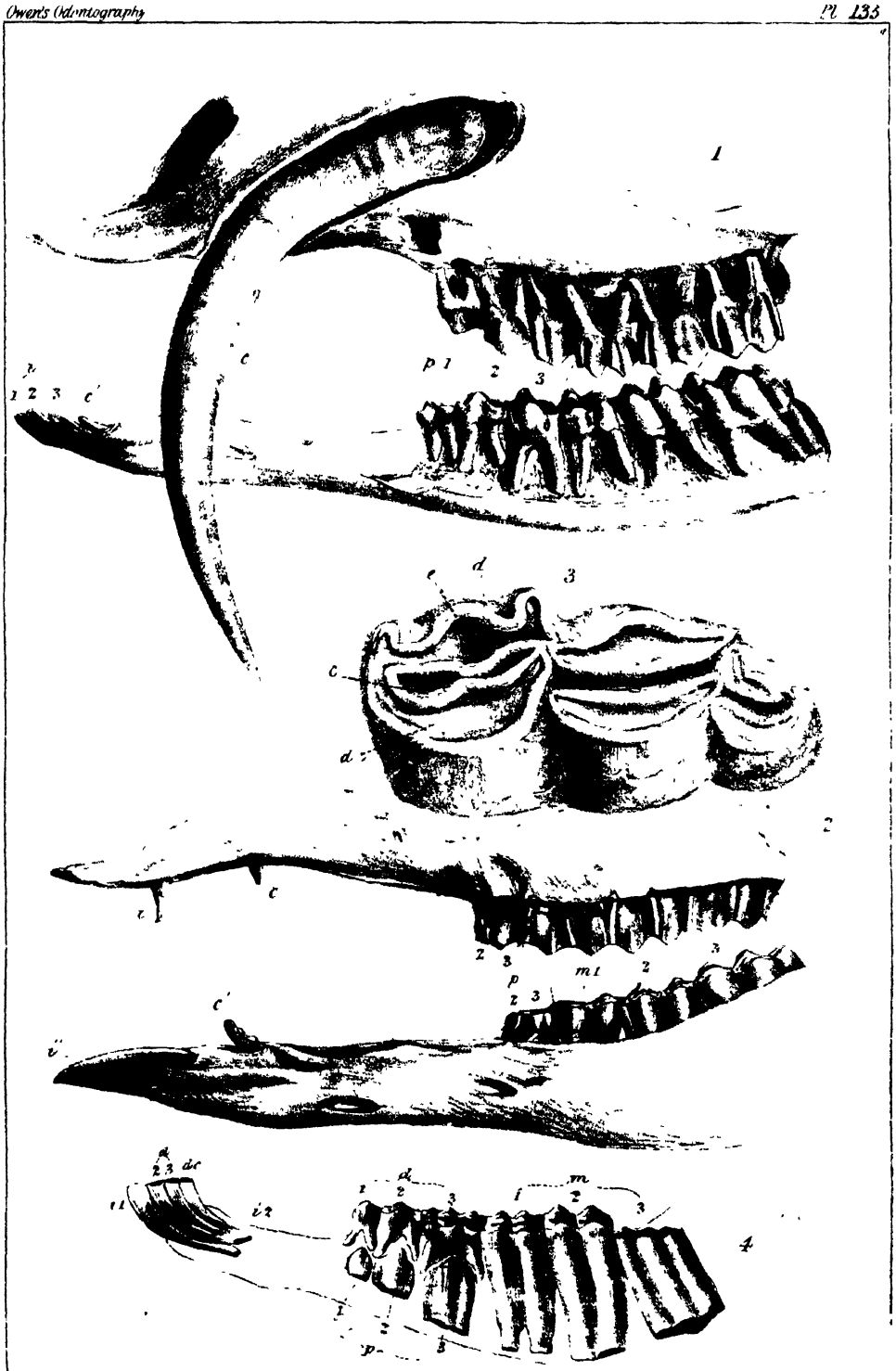
F.G. Sandel—on Lonsdale, Erebus

HYÆNARCTOS SIVALENSIS

3 Natural size



PHOCIDÆ

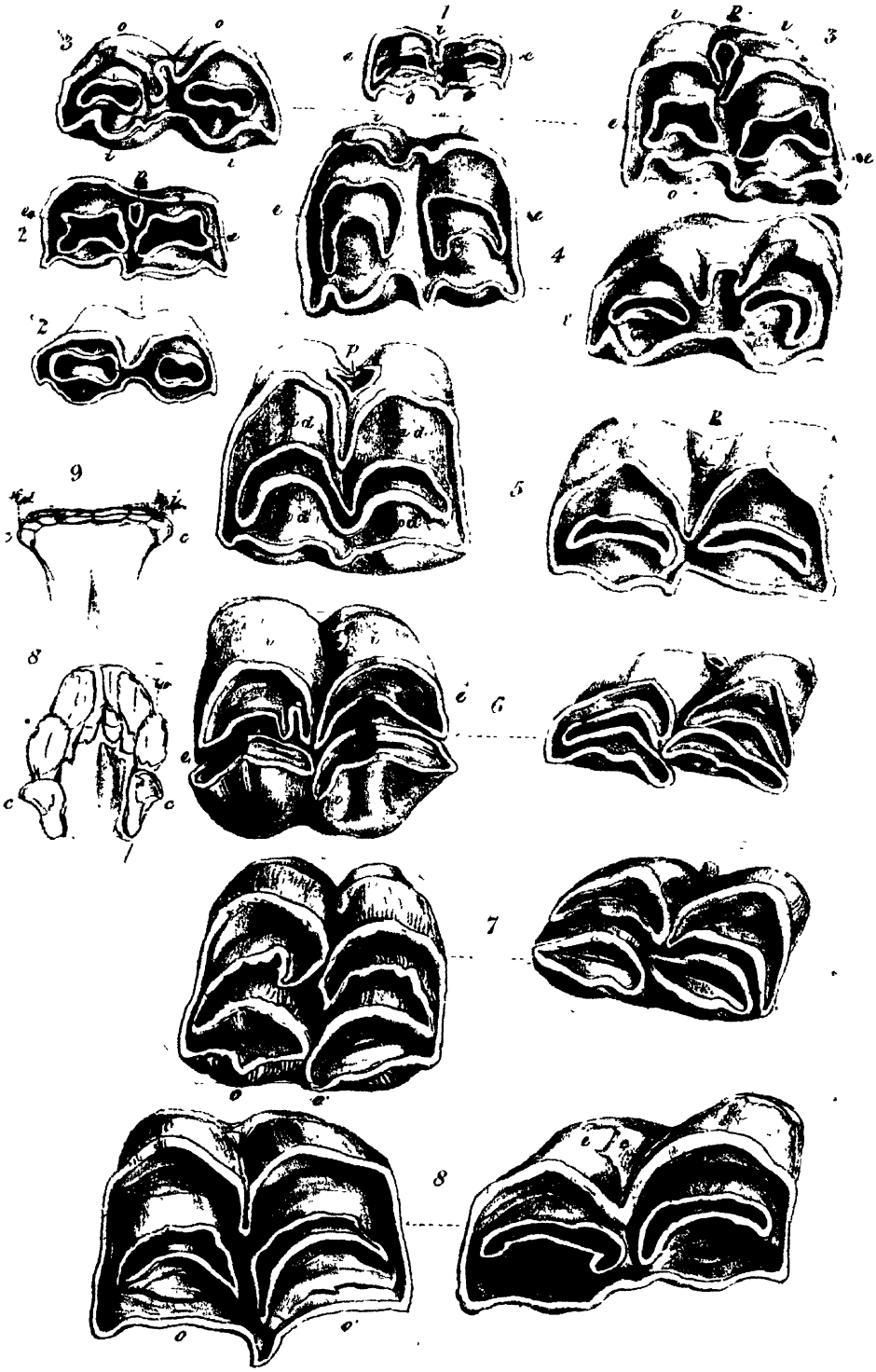


On Zinc by J. Erxleben

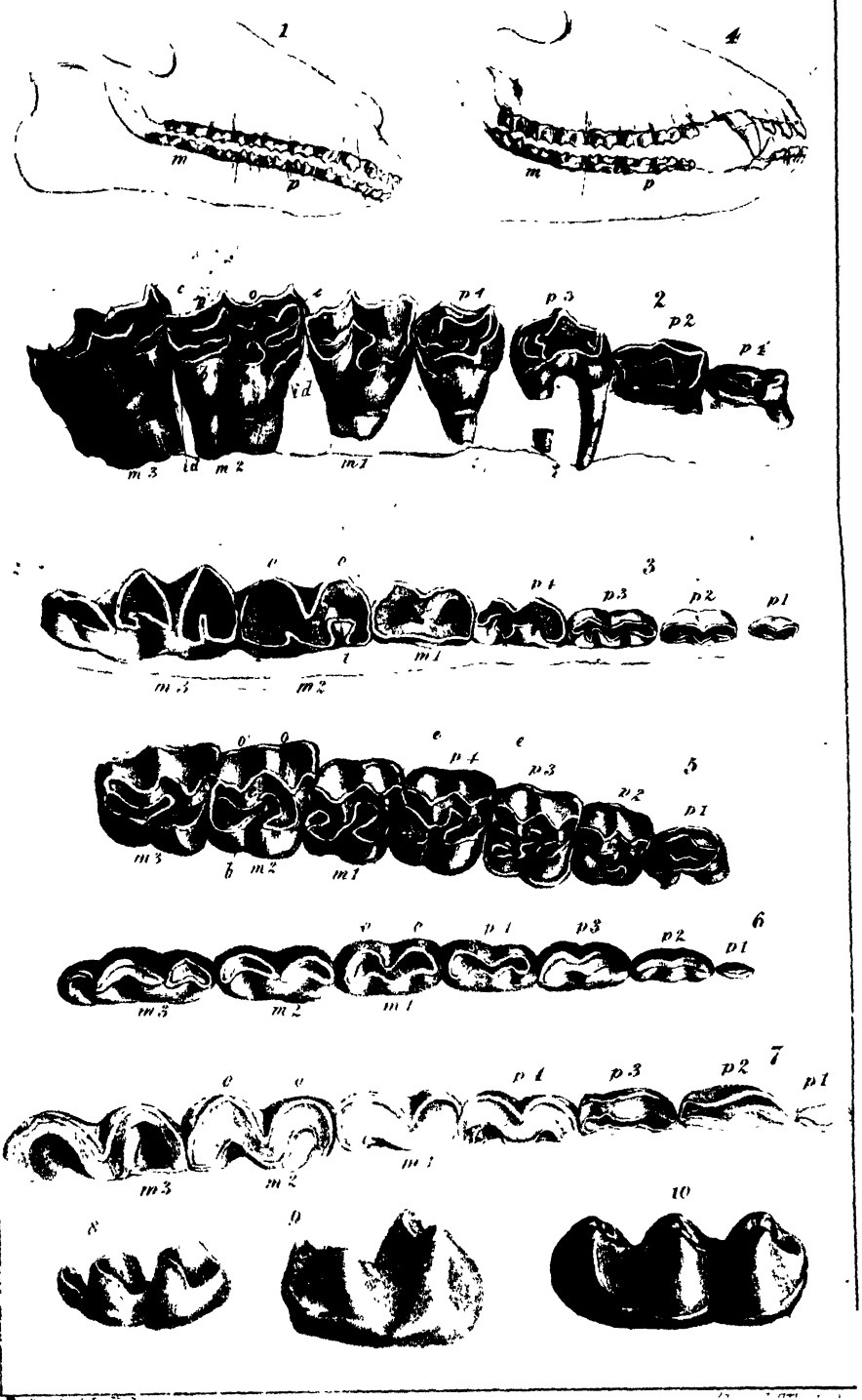
Day & Haghe, lith.rs to the Queen

RUMINAN

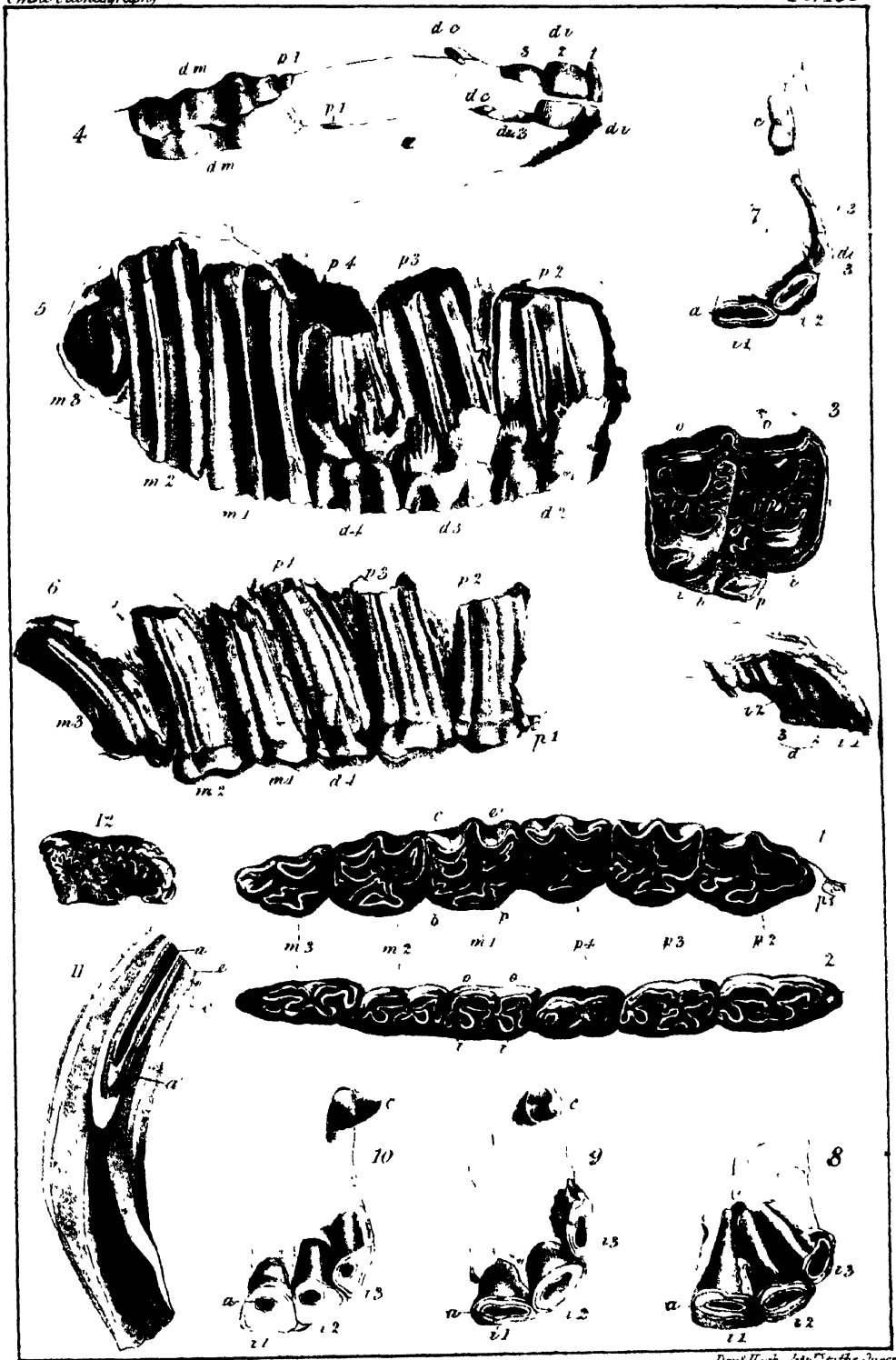
Published by



MOLARS OF VARIOUS RUMINANTS



1 ANOPLOTHERE 6 PALÆOTHERE 7 MACRAUCHENIA

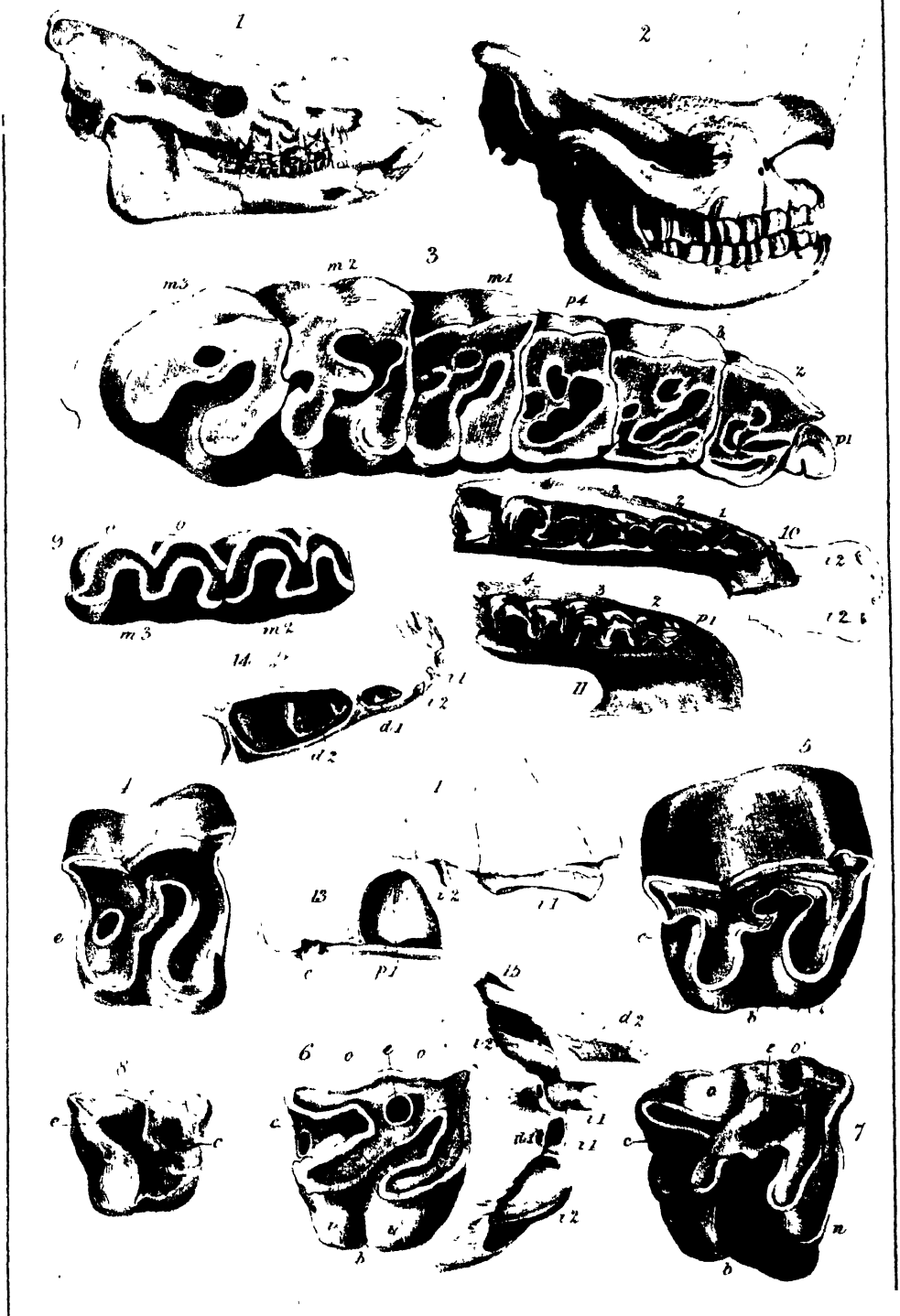


On Stone by J. Erxleben

Drawn & Lithd. by the Queen

1. 11. HORSE. 12. ELASMOTHE



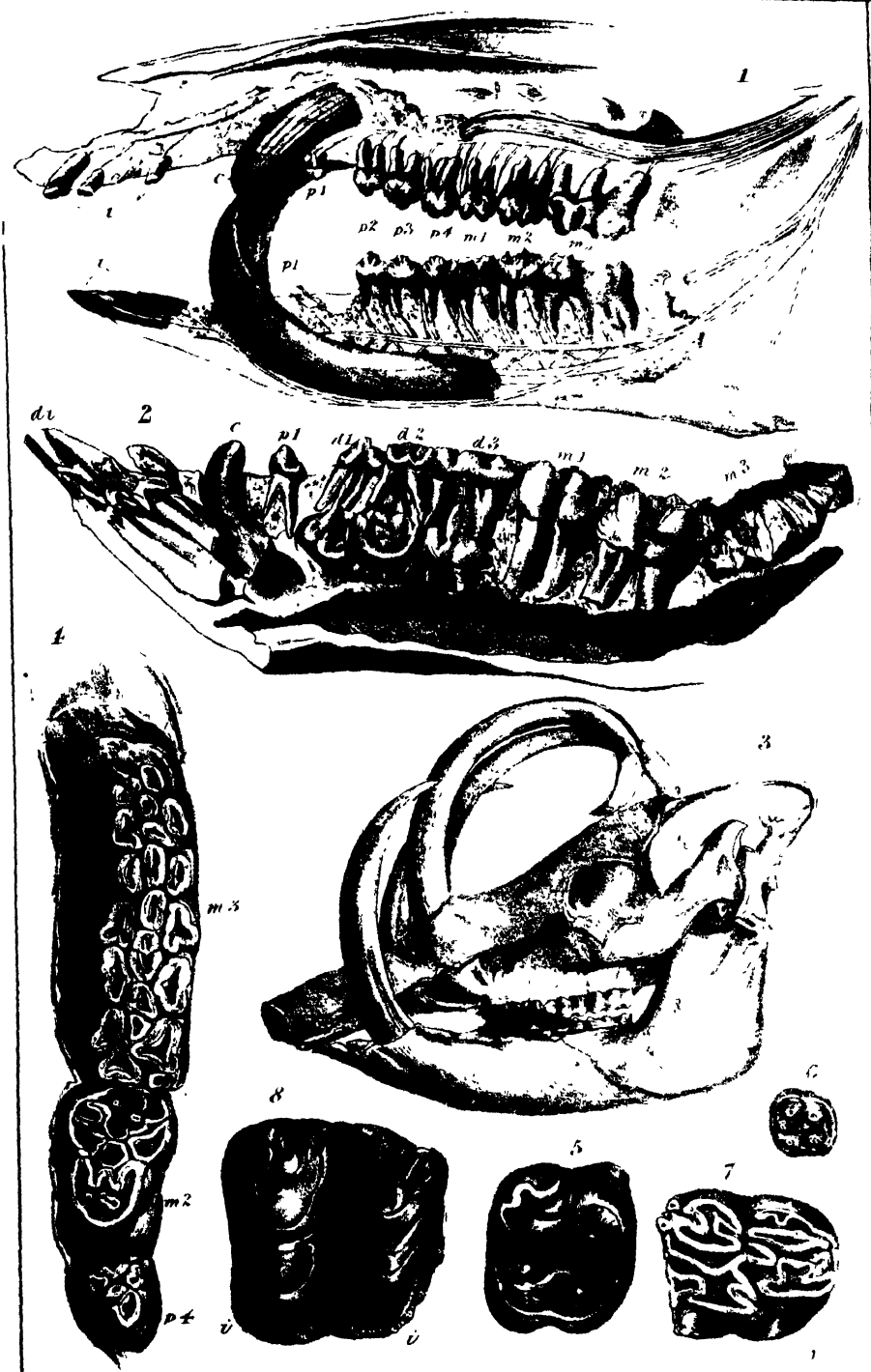


On Zinc on J. Urban

Dan.l Hughes lith.r to the Queen

RHINOCEROS


c
f
d
e
z
s

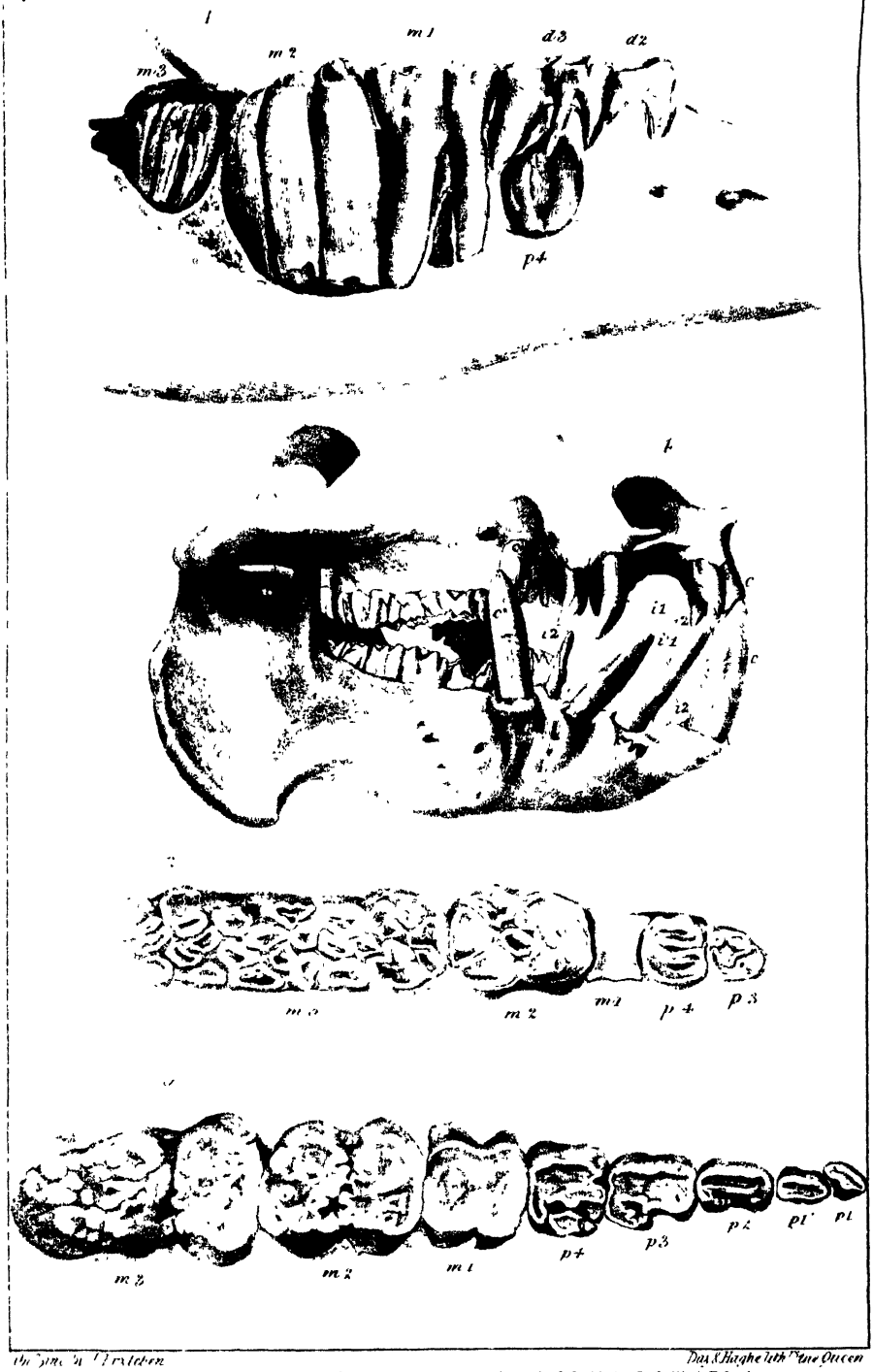


On Zincotype J Erxleben

Day & Haghe Lith.rs to the Queen

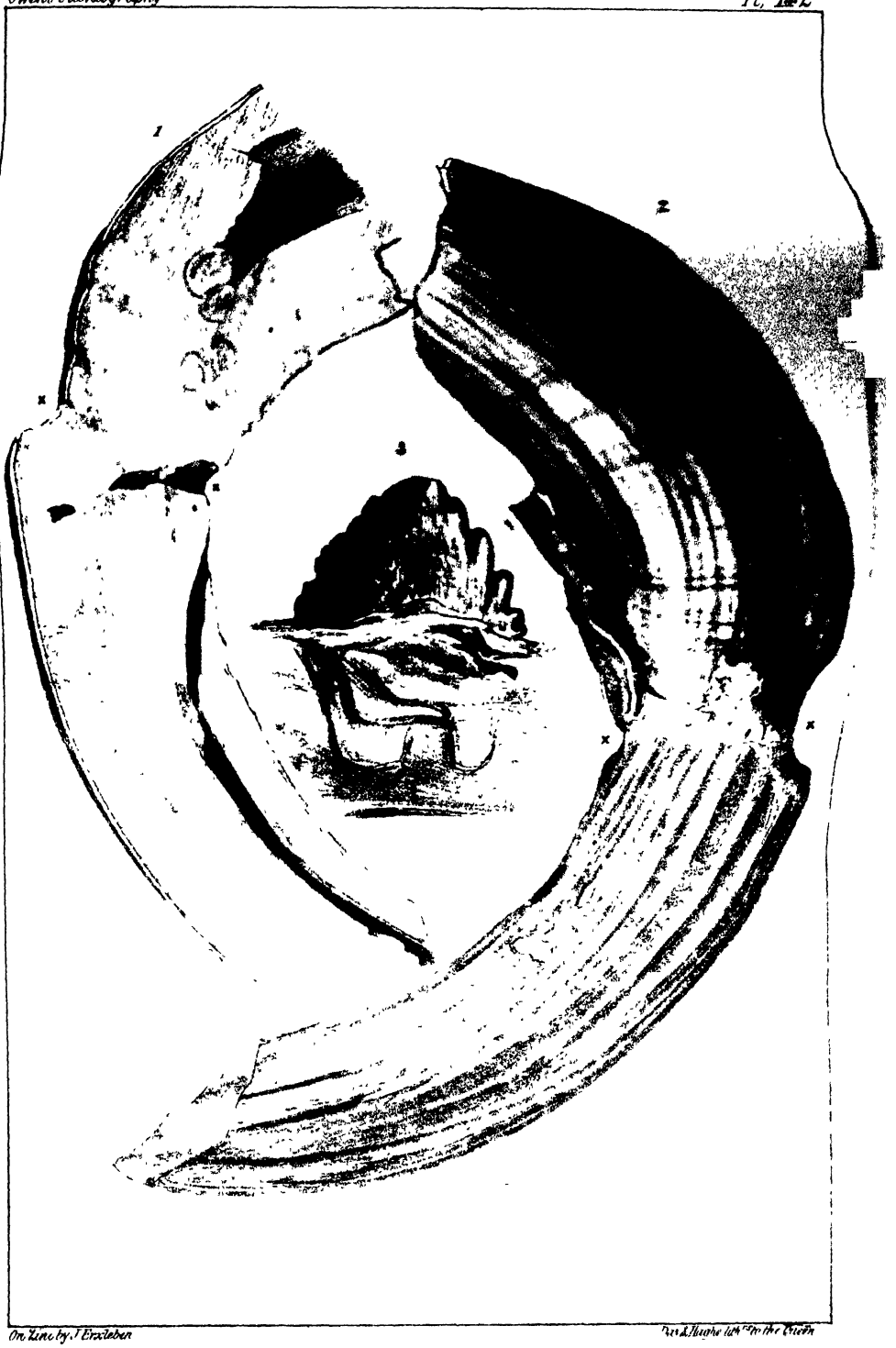
SUIDÆ

London Published by H Baillière 1846



1 2 CHÆROPOTAMUS 4 HIPPOPOTAMUS

London Published by H Baillier 1845



On Line by T. Erxleben

Day & Haghe lith.rs to the Queen

UNITED FRACTURE OF A TUSK

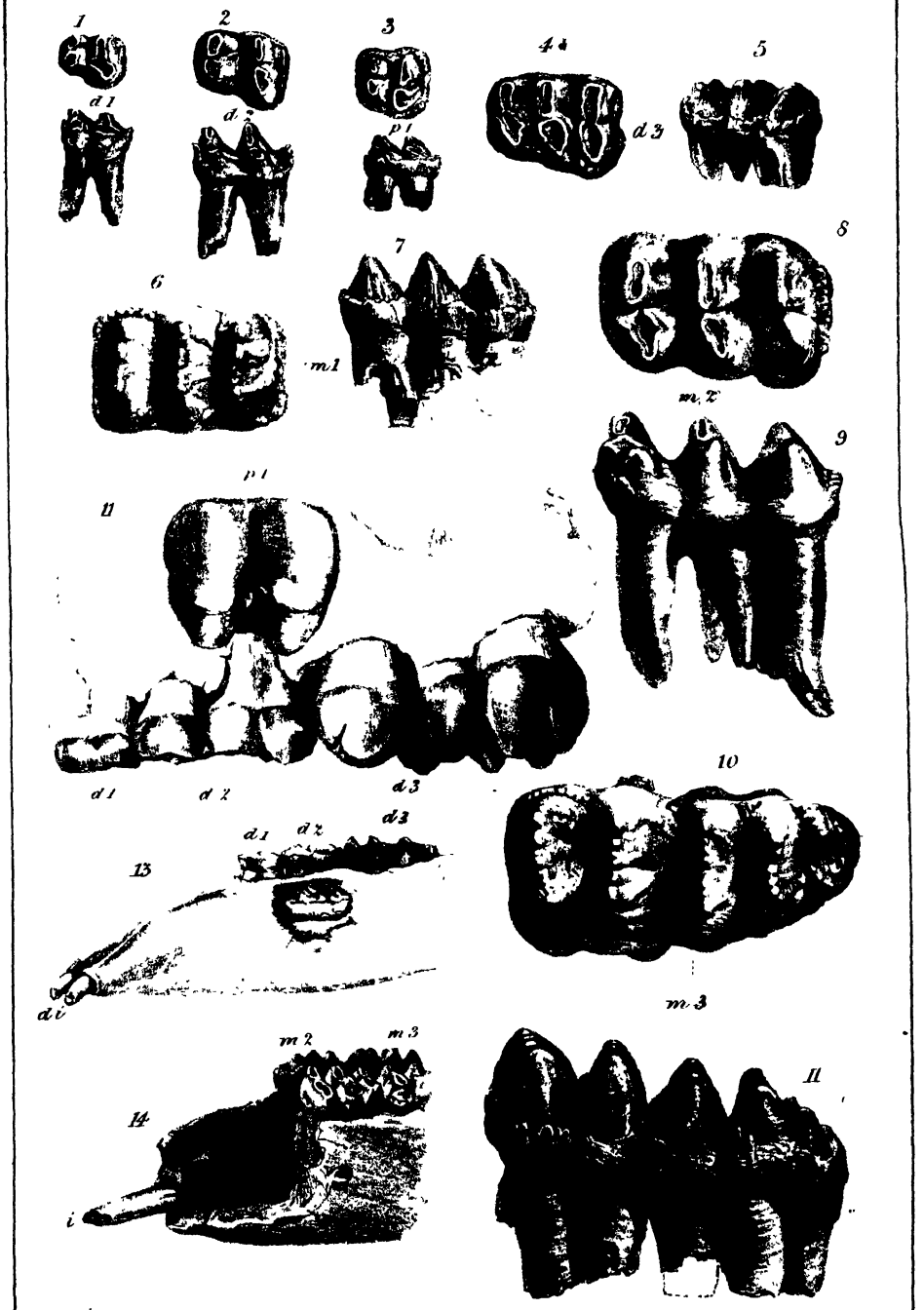
Hippopotamus

Londinensis Publish.



1. HEXAPROTODON 2. HIPPOPOTAMUS

½ Natural Size



On Zinc by J Erxleben

Day & Haghe lith.rs to the Queen

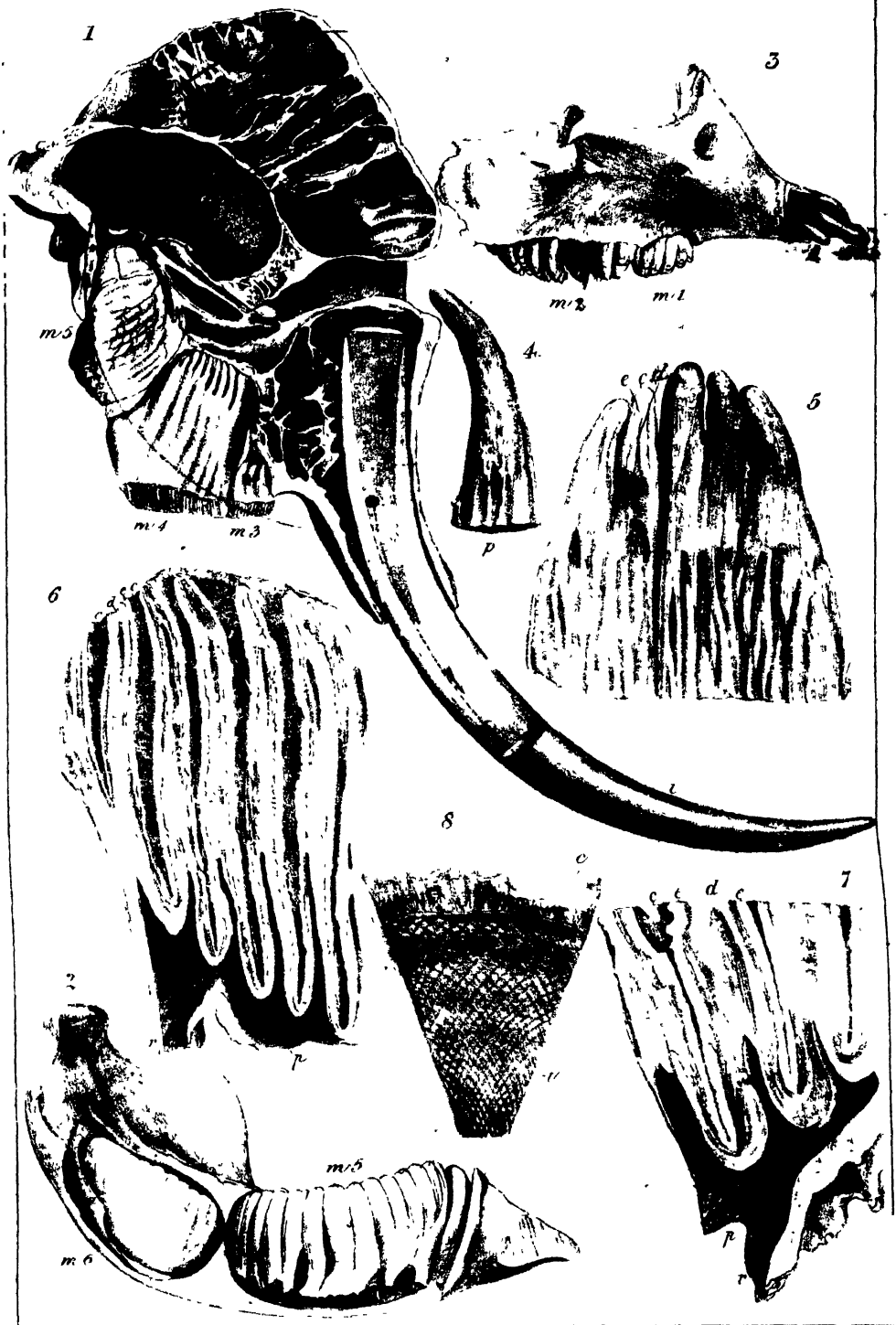
MASTODON

1 & II ¼ Nat Size.

London Published by H Baillière 1844

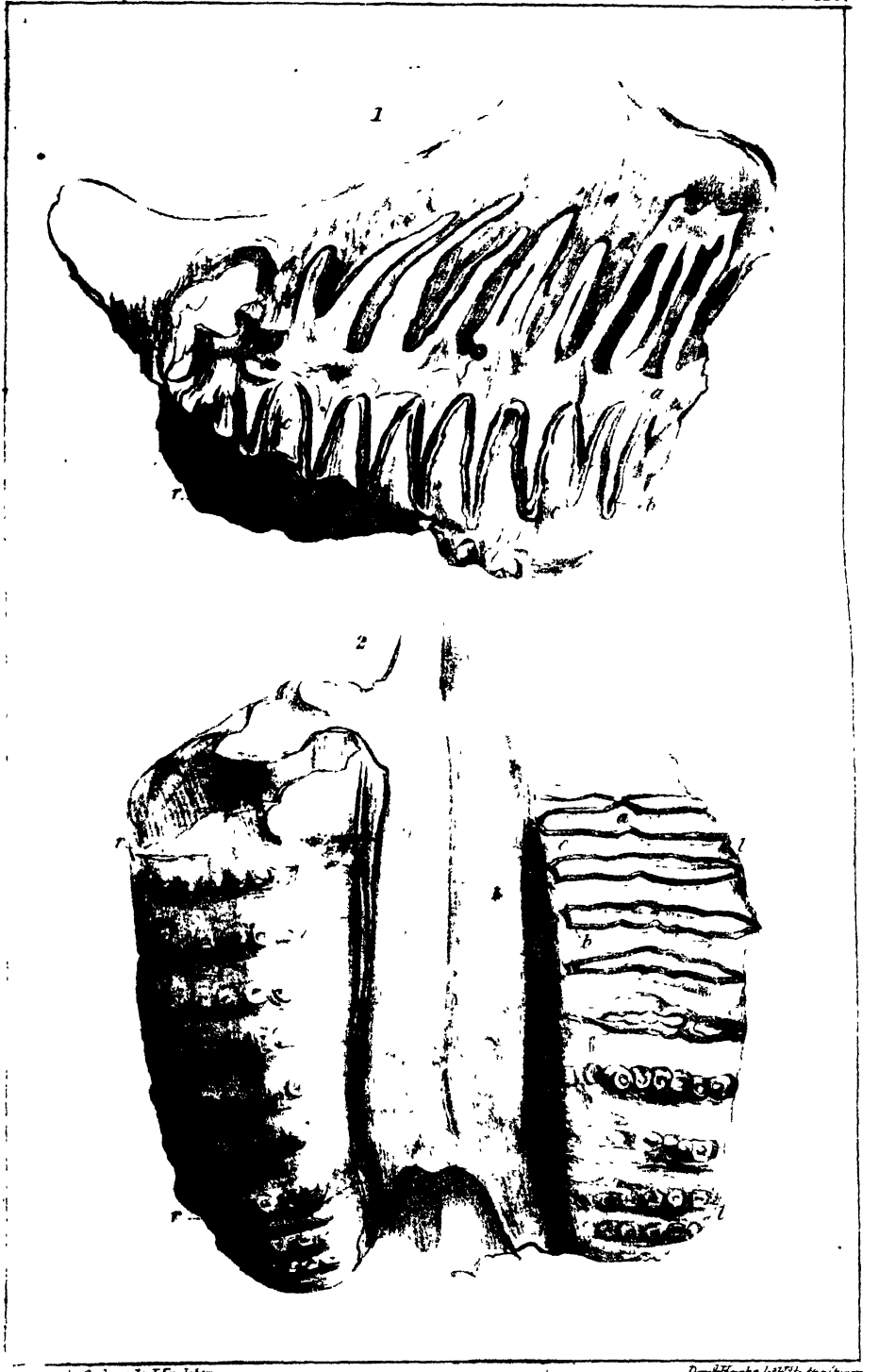


J. Wolf del. et lith. Dav.s Haghe, lith.r to the Queen
MASTODON
London Published by H. Bailliere 1845



On Timm by J. Forrest from.
Day & Haghe lith to the Queen

ELEPHAS



M. & N. Hanhart imp. Day & Haghe, lith.rs to the Queen.

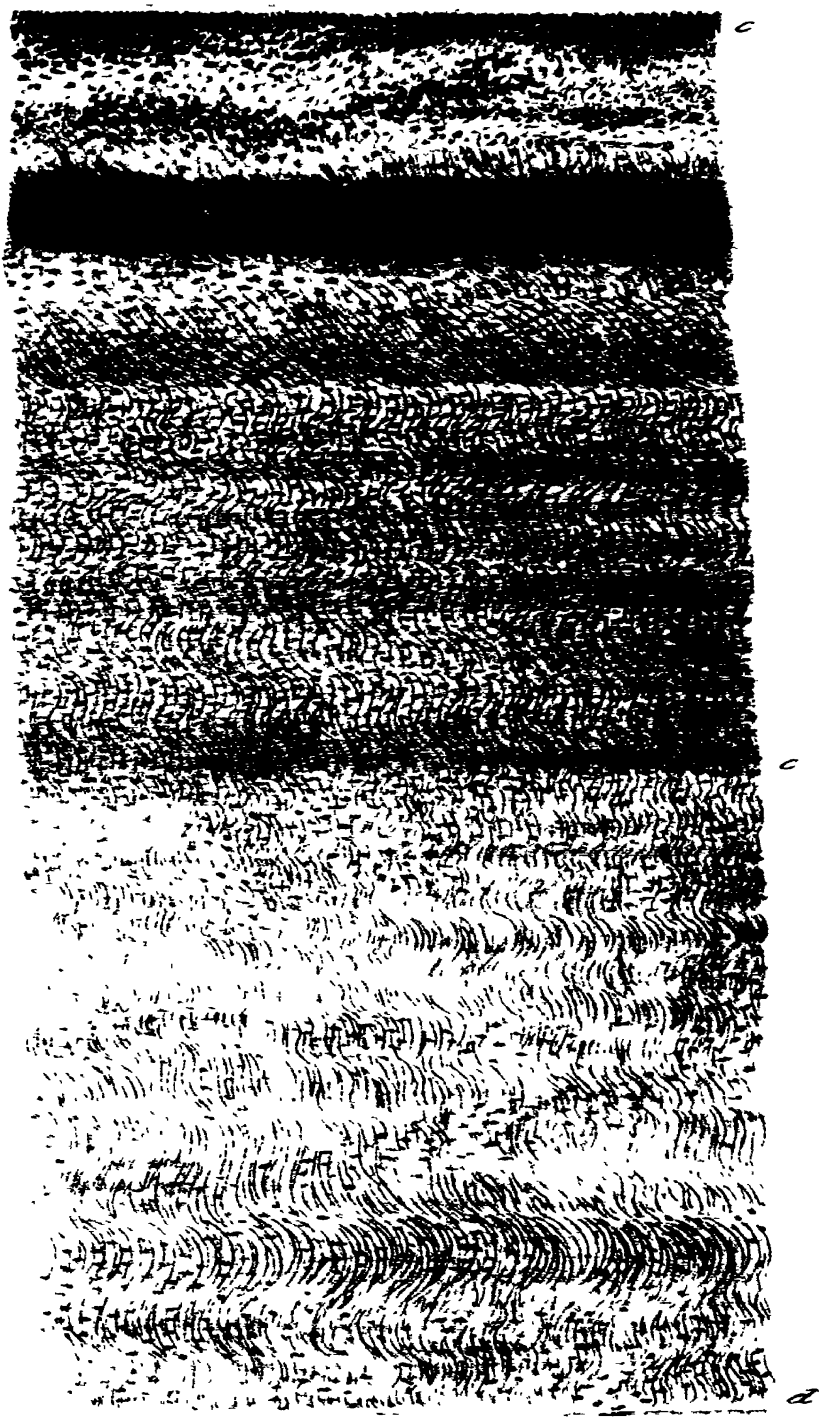
ELEPHAS PLANIFRONS

† Natural size.

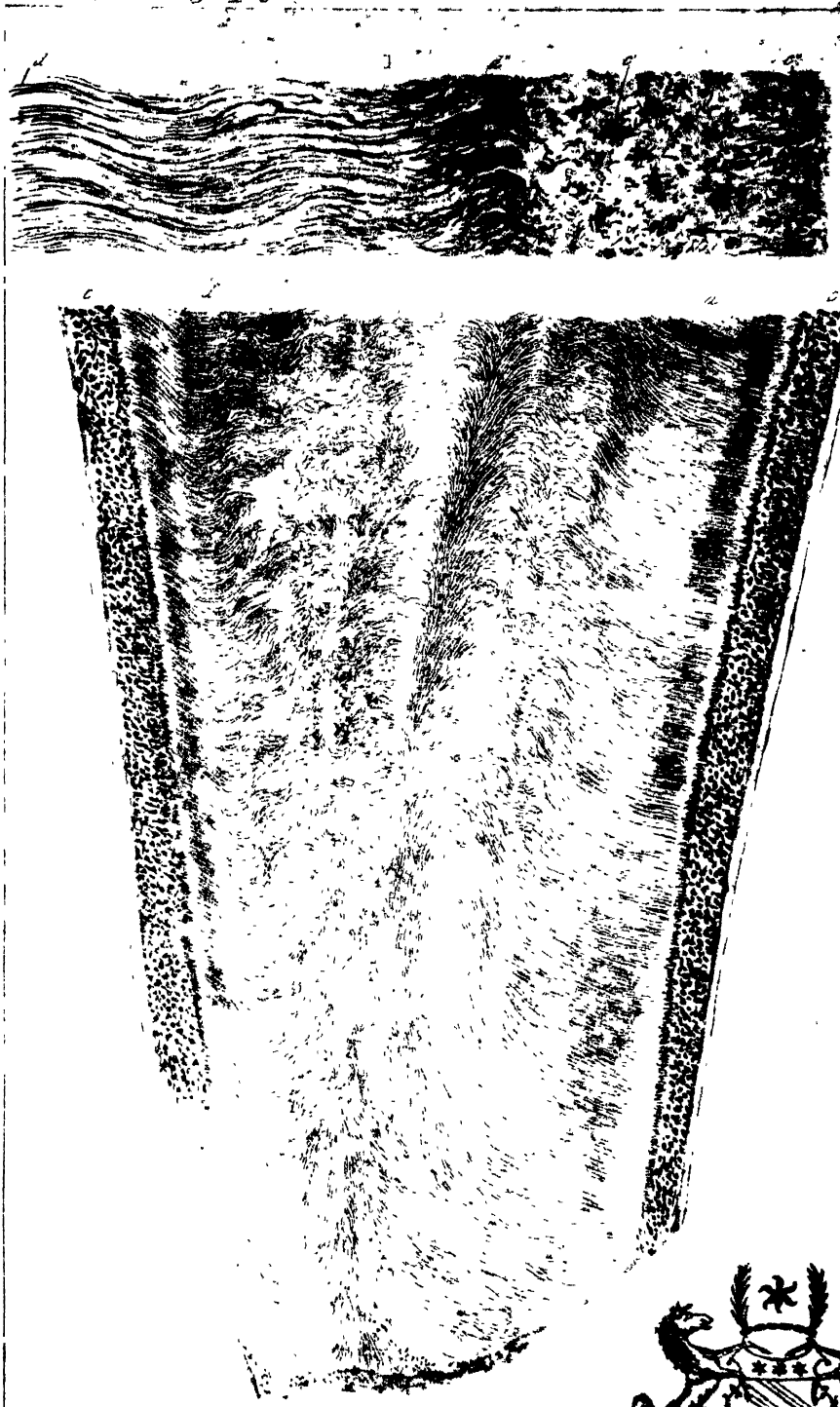


On Stone by J. Erxleben
Day & Haghe, Lith.rs to the Queen

ELEPHAS
3 & 8



TUSK . ELEPHANT



ROOT OF MOLAR ELEPHANT